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TWELFTH SESSION

Cairo, 19-30 January 1933.

GENERAL PROCEEDINGS

3nd Section : **WORKING.**

INAUGURAL MEETING

20 January 1933 (morning).

PROVISIONAL CHAIRMAN : THE LATE YOUSSEF RISGALLAH BEY.

— The Meeting began at 9 o'clock.

The Chairman. — In the name of the Permanent Commission of the International Railway Congress Association, I have the honour to propose to you as President of the 3rd Section Mr. Margot, General Manager of the Paris, Lyons & Mediterranean Railway. *(Applause.)*

— Mr. Margot then took his seat as President of the Meeting.

The President (in French). — I am very grateful to Mr. Risgallah Bey, Member of the Board of Management of the Egyptian Railways, and to the Meeting for the honour paid me. I fully appreciate it and, as President, I promise you that I will do all I can to help in solving the questions before us.

To complete the Bureau, I propose as *Vice-Presidents :*

Dr. E. SEEFEHLNER, General Manager of

the Austrian Federal Railways, member of the Permanent Commission of the Association;

Mr. M. YOYITCH, Assistant Manager of the Jugoslav State Railways, and

Mr. E. SAVARY, Divisional Manager (1st Division) of the Swiss Federal Railways. *(Applause.)*

I also wish to propose, as *Principal Secretary*, Mr. MINSART, Engineer of the Belgian National Railways Company. *(Applause.)*

— As proposed by the President, the Section then completed its Bureau and drew up a provisional agenda.

— The Meeting closed at 9.30.

[656. 223 (.2)]

QUESTION VII :

Allocation of freight rolling stock. Investigation into the turn-round of goods vehicles. Separation of the elements included in it. Methods of reducing the period of turn-round.

Preliminary documents.

1st report (Germany, Denmark, Finland, Great Britain, Dominions and Colonies, Sweden, America, China, Japan, Norway, Netherlands and Colonies), by Mr. W. F. H. van Rijckevorsel. (See *Bulletin*, May 1932, p. 609, or separate issue No. 5.)

2nd report (Belgium, Spain, France, Italy, Portugal and their Colonies, Luxemburg and Switzerland), by Mr. O. Gaeremynck. (See *Bulletin*, July 1932, p. 1259, or separate issue No. 19.)

3rd report (other countries), by Mr. J. Dolinar. (See *Bulletin*, October 1932, p. 1911, or separate issue No. 31.)

Special Reporter : Mr. W. F. H. van Rijckevorsel. (See *Bulletin*, January 1933, p. 83.)

DISCUSSION BY THE SECTION.

Meeting held on the 20 January 1933.

President : Mr. MARGOT.

— The Meeting is opened at 9.30 a.m.

The President (in French). — Today we have to deal with Question VII. This question has been dealt with in three reports presented by Messrs. van Rijckevorsel, Gaeremynck and Dolinar. As everyone has been provided with separately bound copies of the said reports, I will ask Mr. van Rijckevorsel, the *Special Reporter*, to read us a brief commentary on his report, summing up the three reports in question.

Mr. van Rijckevorsel, *Special Reporter* (in French). — I think that the everyone has had an opportunity of reading the special report that I drew up on Question VII. For the sake of briefness, I will read straightways the Summaries I was able to formulate. This work was done in collaboration with our colleague,

Mr. Gaeremynck. I did not have the opportunity of discussing it with Mr. Dolinar, but my summaries are inspired by the ideas I found in his report.

These are my summaries :

1. Having regard to the severe competition set up by other means of transport, care should be taken in any well-organised system of wagon allocation to :

a) Supply wagons as quickly as possible in the order they are applied for;

b) Maintain a sufficient reserve of wagons at ports, industrial centres and markets, to meet straightways all contingencies;

c) Avoid senders being kept waiting too long for the wagons they have applied for, even during busy periods (seasonal traffic, etc.);

d) Simplify as much as possible the formalities to be complied with by senders when applying for wagons, without permitting senders to know each others' requirements;

e) Apply with the greatest circumspection charges such as for demurrage and for non-use, deposits, etc., likely to irritate traders and alienate their custom;

f) Comply as far as possible with senders' requirements in supplying wagons, the choice being generally left to the railway within the limits of the rate conditions. If the type of wagon required is not on the spot and the railway substitutes another type, the trader should not suffer any disadvantage thereby in the matter of the carriage rate charged.

2. With a view to the economical use of wagons it is desirable :

a) To use foreign wagons at all times whenever possible, within the limits allowed by the exchange agreements. The cost of empty haulage is considerably higher than the additional wagon-user charge payable on back-loaded wagons;

b) That the number of categories of wagons should be reduced to a minimum, and a standard type established for each category, with a tonnage capacity corresponding to the maximum axle-load allowed;

c) That the use of private owners' wagons should be encouraged for all goods which would otherwise require railway-owned wagons deviating from the standard types;

d) That rate reductions should be granted to encourage the loading of wagons to their full capacity;

e) That rates should encourage the consignment of goods in large quantities or in train loads;

3. With the object of enabling a rapid and economical allocation of stock to be effected and of ensuring accurate and prompt execution of the wagon control instructions, it is necessary that :

a) Reports of wagons on hand and needed should arrive at the control offices at such time as will enable the latter to so issue their instructions to the stations that the least possible time elapses between the receipt of the instructions and the despatch of the wagons.

b) The central control office and subsidiary allocating centres should keep in touch with each other by telegraph or telephone.

c) The wagon control staff should be well acquainted with the requirements of traffic and the running of trains and alterations therein, and should keep in close collaboration with the goods train and shunting departments so as to obtain prompt execution of all needful operations with a view to speeding up the turn-round of stock.

d) The wagon reports furnished and the execution of the wagon control's instructions should be regularly checked by competent inspectors.

e) Standing orders should wherever possible be elaborated for the despatch of empty wagons to stations continually in need of supplies.

The President (in French). — I thank the Special Reporter for having been good

enough to sum up the summaries of the reporters in such a concrete way. It seems to me that this summary does indeed contain all the matter of the reports.

We will go on to the general discussion.

Has anyone any objection to make, or does anyone desire to add any recommendation ?

Mr. Tuz, Polish State Railways (in French). — I would like to make a few small observations about the special report, a report which — I very willingly admit the fact — shows that the question has been studied down to its smallest details.

If the railway system is very extensive and covers large areas, the central control of the allocation of wagons becomes very difficult, and it may be necessary to organise several offices for the allocation of wagons, the sole task of the central control then being to maintain a regular circulation of the wagons between the regional offices. In this case it is necessary to lay down the programme of the allocation of wagons for each regional system in conformity with the demands of each district, according to the statistics of the previous years, and taking as basis the coefficient of the average turn-round of the available wagons.

The Administration of the Polish Railways, benefiting from the experience of the main line railways of other countries, prepares the monthly wagon allocation programme for each of its nine regional divisions. This programme is based on the estimated number of wagons to be loaded during the succeeding month, using the turn-round coefficient corresponding to the local conditions of each district. The central office merely controls the carrying out of this allocation programme and intervenes in case of necessity, in order to correct any errors observed.

The preparation of the wagon allocation programme between the regional offices is a guarantee that this programme has been properly carried out, and an assurance that the different districts will be properly supplied with wagons; and it is a practical way of obtaining a considerable reduction of empty running.

This system has made it possible to increase the number of wagons loaded daily. The number of wagons loaded on our system has reached an average of 20 000 a day. In order to calculate the wagon allocation programme, the Polish State Railways have applied a coefficient of turn-round based on the formula of the Paris, Lyons & Mediterranean Railway. In our opinion, this formula gives good results.

To conclude what I have just said, I propose we add the following to the summaries of the Special Reporter :

« On extensive railway systems, it seems desirable to draw up periodically a wagon allocation programme in conformity with the loadings expected, by applying a turn-round coefficient calculated from the statistical records. When making this calculation, the simplest formulæ are sufficient. The turn-round coefficient as well as the average time a wagon remains in each station should be under constant control. »

The President (in French). — You are referring in fact to summary *e*) of the Special Reporter : « Standing orders should, wherever possible, be elaborated for the despatch of empty wagons to stations continually in need of supplies » which you propose be completed by the details you have given. Is this what you mean ?

Mr. Tuz (in French). — It seems to me that the Special Reporter said that the wagons should be controlled by a central organisation. There are main line railways on which the allocation of wagons is not centralised but is dealt with by the district offices. There must be added that the wagon allocation programme depends upon a central organisation which controls the district wagon allocation offices.

The President. — This is more general than the wording of the summaries. Has anyone else any other ideas or innovations to put before us ?

Mr. Stäckel, German State Railway Company (in German). — Summary 1 *b*) says that care should be taken to maintain, in the ports, industrial centres, and markets a sufficient reserve of wagons so as to be able to supply the necessary vehicles. It is only possible to have such reserves at times when rolling stock is abundant; at other times it is necessary to take suitable steps to facilitate the working.

I think therefore that from this point of view it would be well to modify the text in question.

The President. — This second remark should be taken into account. Are there any others ?

Mr. Direz, French State Railways (in French). — The question we are discussing today has always interested me greatly; I have been dealing with it for a long time and, therefore, I should like to express some ideas about it.

The problem of the allocation of wagons, in actual fact, can be divided into two parts. When a small station asks for a wagon of a given type, there must be someone whose duty it is to supply it. This is one part of the working out of the allocation. As a general rule, there is too much of a tendency to think that a wagon controller ought to be occupied only in carrying out all these operations for all the stations asking for stock.

Mr. Tuz has just told us that on great railways it is necessary to have wagon allocation centres. But on a large railway system, there must be quite a large number of such centres. The central wagon allocation control deals with the wagon movements in order to maintain equilibrium between the allocating stations. The problem of the central wagon controller is to arrange movements of empty wagons to balance the flow of loaded wagons. If the loaded stock flowed towards a given centre and came back from it empty, it would be a simple matter. But empty wagons have to be sent to feed the loading centres, such as coal mines, ports, which as a rule are importing ports, requiring a great amount of empty stock which they will despatch loaded.

The problem is very simple as regards the central control, since, as the Polish delegate has said, as well as our Belgian colleague, one can base oneself more or less on the experience of previous years. Under these conditions, it is possible to figure out in advance the importance of the wagon movements with more or less accuracy.

The wagon allocation problem to be really solved, requires, however, a rapid turn-round of the stock. And this is the second point which I wish to stress.

Our Polish colleague has told us that the average number of wagons loaded on his railway system is as high as 20 000 a day. Therefore for a period of 5 days 100 000 wagons are required, for 6 days 120 000, etc. The railway can carry out its task according to whether the turn-round is fast or slow. But we should endeavour to stress the fact that a fast

turn-round is very important, and this is obtained by different means. In the summaries I think it would be well to stress this point.

In fact the reports presented seem to show that all the railways have investigated the methods of allocating wagons. It seems to me that, in the summaries we have to draw up, we might say, in a general way, that the railways have studied the question, that there are different methods, the differences being due necessarily to the traffic conditions of the different railways. We might then stress the importance to be attached to what I would like to call a scientific organisation of the allocation.

Our Belgian and Dutch colleagues have discussed how traffic constancy makes it possible to have a more or less continuous allocation; they have mentioned in their reports that certain railways deny this constancy. In my opinion, it would be quite easy to get everyone into agreement by saying that the traffic currents should be investigated. It would, however, be a bad plan to allow a station to send on wagons, each acting as he thinks fit. By allowing stations to take wagons as they please, we should find, in the case of seasonal traffic, certain stations helping themselves without control and taking more wagons than were necessary, and in consequence becoming blocked. The fact that it is necessary to feed a mining district or a port leads sometimes to wagons being detailed from empty wagon trains; the result is a shortage of stock, which is bad.

I wish to show that it is a good thing not to interfere with the regular currents of empty wagons, as they enable a rational allocation to be made. This regular movement of empties varies a great deal and, if need be, must be imposed to ensure specified centres providing a fixed number of wagons daily; the order allocating the wagons must be carried out as a whole. This allocation programme enables the two requirements I just mentioned to be met, and in particular the fast turn-round of the stock. When the plan for the transport of empties is examined, it will be seen that organisation is necessary; the programme must be based on the slack stations. Nowadays, as far as possible, the work is done in the stations themselves, if the layout is such that sidings can be provided nearby so that complete trains can be formed and worked forward to the centres of consumers so that they arrive in the morning before loading is begun. This makes it necessary to count the number of empties during the night.

It is not always possible to do all this, but time is saved by organising the empty wagon trains to suit the actual conditions. I might remark that working through trains, to well considered timings, enables the wagons to be taken at the end of the day and run during the night. The ideal would be to put them at the disposal of the consignees the next day. We might arrive at an ideal allocation according to the following processus : wagons loaded during the course of the day, worked to destination during the night, unloaded the next day and returned to the loading point during the following night.

There is no question of working a rake of wagons backwards and forwards. Without going so far, it is certain that the problem of loaded wagons is as interesting as that of empty wagons. The rapid transport of empty wagons would save time on the turn-round. This is the idea that I should like to express as a capital point to be maintained in the summaries of the reporter.

I would like to point out in passing that our Section has also to deal with an-

other question of equal interest : that of the transport of parcels traffic with the creation of centre-stations which, in my opinion, may improve the turn-round of the wagons. I am speaking of my own railway system which is not an industrial one and is 9 000 km. (5 600 miles) long. We wish to increase the parcels traffic, which represents 1/3 of our total traffic as regards receipts. The scattering of wagons with very small loads on little frequented lines obliges us to increase the time the wagon is standing and upsets the allocation. If we were able to institute centre-stations for loading and unloading, where the goods would be taken and conveyed by motor lorries, we would be able to speed up to an appreciable extent the turn-round of the wagons. It is absolutely necessary that this question be dealt with as a wagon-day is costly when the traffic is heavy.

I should like these points to be also retained in our summaries and, calling to mind what the President of the Association said yesterday, i. e. that the railways are being perfected daily, I would like to stress the valuable effect on the improvement of the turn-round of improvements in the telephone system. Personally, I am not altogether in favour of this method for the allocation of wagons. I think that it might be utilised more advantageously if it were used to follow up the wagon movements. Both the empty and loaded wagons must be followed up. When a wagon has been unloaded it must not be put on one side. There must be no waiting for an engine and train staff, neither must the staff be idle while awaiting the trains. Here we have a whole cycle of operations to be followed up, and I think, in fact, that the dispatching system would enable improvements to be made in the situation. By means of these innovations, the turn-round will be appreciably improved.

The reporters have stressed the advantages of the standardisation of wagon types. I think that in this case no particular recommendation should be retained. The question of the standardisation of wagons has its partisans and its adversaries. It is obvious that a station receives goods under one form and sends goods away in another form. If our wagons are too specialised and cannot be adapted to these two kinds of goods, we shall have useless train movements which will greatly complicate the operations. Standardisation must make it possible to decrease empty running, which gives rise to unproductive expenditure. In France we usually estimate empty running at 30 %.

In the summaries of the Special Reporter it is said that the allocation services should be in close contact with the train services. In my opinion, the allocation service should be the general operating service. The allocation should not be carried out by other officials than those who direct the service. I would never allow the allocation to be carried out by any other department than the operating department.

Not only do I agree with the wishes of the reporter, but I would go even further. I think it should be the stationmaster, who represents the service, who should carry out the allocation himself. Everything that I have said about the organisation of the turn-round, the despatching, etc. relates to services under the operating department.

The allocation problem has lost its importance with the decrease in traffic. But the problem will arise again tomorrow, even if the traffic does not regain its old value, because the railways will be unable to replace their stock and finally

a moment will arrive at which the work is being done with only just sufficient rolling stock to meet the requirements.

Having said this, I think it would be of use to draw up a scheme of the measures to be taken in the case of exceptional traffic. By this I mean seasonal trains, which every railway has to deal with. The cause of high expenses is the variation in the amount of traffic. If we had traffic that remained constant over the whole of the year, we would be able to work under good conditions. Unfortunately the traffic varies, I will not say every day, but periodically. The traffic hardly changes from one period to another, and it is when the traffic increases that difficulty is experienced in providing sufficient wagons. We speak of a lack of wagons, but there is no such thing; the lack is simply due to the turn-round not being sufficiently quick.

In the course of my career, I have seen many crises; I have seen some terrible ones. And I think that such crises have never been due to lack of stock, but rather to lack of organisation in circulating the empty stock : the fact that one organisation is not working properly is sufficient to stop the wagons and, even if only for a few hours, this at once slows down the turn-round.

Mention has been made of a railway system on which 100 000 wagons are loaded every 5 days, i. e. an average of 20 000 a day. But if there are not available sufficient locomotives to haul these 20 000 wagons, it may only be possible to send 19 000 of them away. In this case 1 000 will be held back one day. The traffic will be increased by the same amount the day after. But the day after there will still be 19 000 loaded wagons sent away out of 20 000. And this in two days will increase the turn-round by 2 000 wagons. Thus a day will come when there will no longer be a sufficient number of empty wagons for 20 000 a day to be loaded, and it will be said : there is a shortage of wagons. In reality there is no shortage of wagons, but rather a shortage of locomotives; the turn-round is not carried out properly. If there were an unlimited number of wagons, they would go on loading 20 000 a day, but only despatch 19 000 of them. In the end there would be an awful block, and the very abundance of wagons would be a bad thing.

Instead of the shortage of motive power, we might consider the case of insufficient output. The trains arrive at a shunting station, and if the traffic is at its maximum intensity, if the limit of capacity of the station has been reached, the latter will be chocked up and the work will suffer, and so a demand will be made to limit the number of trains. The result of this will be a slowing up of the traffic, and as this stituation will get worse day by day, the insufficient output will lead to the station being blocked.

I will go even further. I have seen crises of all kinds. I can remember times when large cities, such as Paris, receiving insufficient supplies, suddenly received large quantities of goods to be unloaded. But there was not sufficient transport to carry these goods from the station to the factories. I have noticed this in periods of great industrial activity. On our railway system, the greater number of factories on the Seine receive their supplies by water. If there should be sufficient frost to stop navigation on the canals, or when navigation is slowed down and finally stopped through the flooding of the Seine, too much traffic is diverted to the railway and this leads to a hold up. What hampers us in this case is not a shortage of wagons, as in this case we can speed up the night traffic, but the factories

themselves having no proper cartage equipment hold up our wagons and thus delay the turn-round, which finally leads to a shortage of stock, the shortage being a consequence of the crisis, and not its cause.

For this reason, I think it would be as well to examine the measures that should be taken in the case of exceptional traffic due to seasonal requirements, whether normal or accidental.

I think that we might discuss the improvements to be made in the train workings. One of the reporters has mentioned a measure which I must admit I do not understand : it is that relating to running trains which are not fully loaded. On our railway system there is a very large variation in the traffic. In October it is 20 % higher than in July and August. I understand the effort that has to be made by the locomotive running department to increase its staff and stock by 20 %; it is a very considerable effort. If we had sufficient stock to organise such trains, the service would nonetheless be severely held up through a shortage of engines and staff.

I am rather opposed to the idea of allowing stations to send on trains that are not fully loaded, and all the more so because in this way there is a risk of losing control of the services.

On the other hand, by authorising the running of trains hauling less than their full load, we shall have insufficient engines, which hinders the turn-round and has other drawbacks.

I suggest that we retain the idea that, in times of exceptional traffic, motive power has to be increased and the trains speeded up, even if this leads to a decrease in their loads.

I would like to remind you that the reporter has stated that when the traffic is heavy, it is necessary to increase the facilities at the disposal of stations in order to speed up shunting. Here again there is much to be done. Let us take the case of a river port 15 km. long. It is obvious that the more loading there is carried out on these 15 km., the more locomotives will be needed to despatch the loaded wagons and distribute the empty ones; in a word it will be necessary to increase the number of locomotives in the shunting yards.

I must ask you to forgive me for having spoken at such length, but I thought it would be useful to stress the essential points in the very interesting report drawn up by our Special Reporter.

The President (in French).— You have been listening to a statement from one who has had a very long experience in such matters, the head of a department of one of the French railways. This has given us a clearer insight into the reports. Mr. Direz has studied them very closely and wished to draw out their quintessence so as to stress the ideas which, in his opinion, might be made into recommendations.

He has considered the question from his own personal point of view, and we should recognise his competency in the matter. Mr. Direz has given us some details which should be kept in mind.

He has told us that all the railways have adopted very similar solutions, which differ a little one way or another, according to their special requirements. He has shown that even if there were different methods to assure the solution of the allocation problem, there would however be very great similitaries between them.

He dealt with the question that seemed of the greatest interest to him, and, like the Special Reporter, he has turned towards scientific organisation of the allocation in the cases in which it can be

realised, that is to say wherever there is a relative constancy in the traffic requirements, and were there is sufficient stock. He has explained that there should be an allocation programme for the supply of wagons according to the traffic. He has shown us that this programme should lead to the organisation of through trains, to serve stations with heavy traffic so as to improve the allocation. In a parenthesis, he showed us the role of the centre-stations, which will be dealt with tomorrow during the discussion on Question VIII. This point has been raised by Mr. Hauterre, Special Reporter on this latter question. He has connected up this question with that of through trains, because, in his opinion, the centre-stations serve to centralise the parcels traffic and load tranship wagons; the system favours the running of through trains which can be run with the minimum number of stops.

After having spoken about the centre-stations, Mr. Direz showed the value of improvements in the telephone system, as well as in train despatching. He does not wish to make a speciality of the despatching but recommends it for the control, a point which the Special Reporter also made.

He spoke with interest on standardisation, useful from the point of view of the simplification of the allocation operations, of the decrease in the turn-round of the stock, a very interesting question which is not included in the special summaries. From the point of view of seasonal traffic, Mr. Direz has shown that there are very great variations in the traffic; owing in particular to accidental causes the traffic can become very heavy on certain lines. He mentioned difficulties in navigation which might lead to special measures. Without going against the idea of requiring trains to be made up to the maximum load, he suggested faster through trains in order to obtain a better efficiency.

Mr. Direz's statement which I have thus tried to sum up is very interesting, because it appears to me to be a very fitting basis for the summaries, especially if we want to introduce into them the latest ideas deserving to be retained.

In this connection, I would like to raise a point which concerns all the questions that our Section has to study : Are we going to suggest to the Congress summaries which form a résumé of all that was said in the reports, even those common to all, which have nothing new in them ?

Would it not be better to limit them to observations of a general nature, drawn from the reports, retaining only the most interesting points ? This is the question I wish to ask; it is a question of method. I wish to ask it particularly in connection with Question VIII in which case the summaries are rather fully developed; in my opinion we risk decreasing the value of the summaries if the text adopted is too wide in its scope.

If the Section agrees, I propose that our summaries should be adapted to the essential recommendations. Mr. Direz has given us some new ideas which I should like to see included in the summaries.

I suggest therefore that we should not adopt as summaries the methods based on the information supplied by the reporters, methods condensed by the reporters, but that we should extract from these reports, even from that of the Special Reporter, whatever appears to be new. The ideas developed by Mr. Tuz and Mr. Direz should be inserted in paragraph *e*) of point 3 of the summaries.

Has the Special Reporter any remarks to make on this subject ?

Mr. van Rijckevorsel. — I do not see

any disadvantage in your suggestion, and am fully in support of this method.

The President (in French). — We will put down these ideas on paper. We will take the wording of our Polish colleague.

He proposes to add to the summaries of the special report at point 3 *e*): « On the great systems it appears to be desirable to prepare periodically a programme of allocation of wagons in accordance with anticipated service, applying a coefficient of rotation calculated in accordance with statistical observations. For this calculation it is sufficient to apply the most simple formulæ. The coefficient of rotation as well as the average delay of a wagon in each station should be regularly controlled. »

Mr. Direz, on the other hand, has prepared a text which I will ask him to read to us, reserving the right to comment upon it as he goes on.

Mr. Direz (in French). — Here is the text I prepared :

The reports presented to the Congress in respect of the allocation of goods wagons show that in a general way the Railway Systems are inclined towards the same solutions, with certain peculiarities depending on the traffic requirements.

What is interesting in the matter is the tendency towards a scientific organisation of the allocation with the object of reducing the period of turn-round of wagons and of increasing the efficiency of the available stock.

The President (in French). — The dominant idea is, in fact, to realise a scientific organisation so as to reduce the turn-round and increase the efficiency.

Mr. Direz continues to read his proposals as follows :

In this order of ideas, advantage can be taken of the relative constancy of traffic needs and the supply of wagons. When this constancy is noticed, it is possible to set up a system of allocation comprising permanent orders for the direction of currents of empty wagons, supplemented in view of important supplies by other orders varying in accordance with the traffic requirements.

The President (in French). — This is the idea expounded by Mr. Direz at the beginning. He has considered two points: the question of the direction and the question of the amount of stock to be supplied, stating that the allocation programme should indicate those directions which are more or less permanent, no matter what the importance of the traffic, and on the other hand, the importance of the supplies asked for by variable orders.

Mr. Direz :

Such a plan should embody an appropriate organisation of a train service allowing as speedy a despatch of wagons as possible, while serving at the same time the stations with intense traffic at suitable hours for delivery and collection of wagons.

The President (in French). — This passage repeats the ideas of the Special Reporter's summaries.

Mr. Direz :

The formula for centre-stations recommended in the summary of Question VIII regarding the grouping of parcels comes within the scope of this organisation of through trains.

The President (in French). — This is a distinct question, seeing that we have to discuss it tomorrow. We can only include it here under the hypothesis that we must hold to it because of its importance.

Mr. Direz :

The improvements made in the telephone service in the form of « dispatching systems »

can be used with advantage for the rapid circulation of through trains of empty and loaded wagons.

The President (in French). — This is the question about which Mr. Direz spoke when mentioning the additional control by means of the telephone system.

Mr. Direz :

Standardisation of the types of wagons, towards which the efforts of the Railways are directed, tends to simplify the operations necessary for the allocation of wagons, and to reduce the empty running and consequently to decrease the period of the turn-round of wagons.

The President (in French). — This is a truth which it is well to call to mind.

Mr. Direz :

In case of heavy traffic due to seasonal or exceptional requirements, the quickness of the turn-round may call for exceptional measures, such as the formation of accelerated through trains (even if this acceleration results in reduced train loads) the despatch of empty wagons by the quickest way by giving them priority, and the increase of shunting facilities at the stations.

The President (in French). — The summaries which Mr. Direz has just read to us are a complete resumé of the statement he has just made, and it seems to me, in reply to our Polish colleague, that what has been said embodies all the ideas he brought forward a little while ago. Mr. Tuz affirms, in addition, that the calculation of the turn-round coefficient depends upon statistics from which the formulæ developed must be as simple as possible. It seems to me that we should not discuss questions of detail, and that Mr. Direz's text embodies every idea expressed, including the essential points in the Special Reporter's summaries.

I think it would be better to discuss Mr. Direz's summaries. Would Mr. Stäckel mind translating them ?

Mr. Stäckel translated into German Mr. Direz's summaries, which were then translated into Englih.

Mr. Stäckel then reminded the Meeting of the remark he made about paragraph 1 *b*).

The President. — It seems to me that Mr. Stäckel's remark falls within the scope of Mr. Direz's summaries. It would not be a bad thing to note it after the minutes of the discussions have been read. The solution detailed by Mr. Direz corresponds with his own observations. Mr. Direz said that the large markets should be fed by large stations, but the excess stock should not be put into reserve, because in that case it would not be properly used. On the contrary it should be worked forward in regular currents.

Mr. Direz. — In the ports and mining districts empty wagon trains are run every day.

The President (in French).— Mr. Stäckel's remark can be included in the minutes of the discussions. If everyone agress, we might make a reservation as regards this paragraph by adding that the supply of wagons to the ports and markets should be so organised that the stock arrives without loss of time and without being kept idle.

Mr. van Rijckevorsel (in French). — We are in agreement; a certain reserve should always be available.

The President (in French). — The reserve must arrive when it is wanted; that is its purpose.

Mr. Direz (in French). — The wagon movements cause the reserve to vary in

importance. If on a railway system all the demands are met, there is no inconvenience in having a reserve in the ports. But it would be bad policy to have, at certain points, reserves doing nothing when at other stations there is a shortage of stock.

The President (in French). — That is not at all the idea.

Mr. van Rijckevorsel (in French). — It is a question of having a sufficient reserve.

The President (in English). — The reserve applies to the whole of the stock. We will take it into account in the minutes of the meeting.

Mr. Gaeremynck, *Reporter.* — Our idea was to have a reserve, whether made up permanently or not. The interesting question is to provide for it in the stock of wagons. Between the periods of heavy traffic and those of normal traffic, there is a very great difference. If there is a shortage in the time of heavy traffic, it is obviously no longer possible to form a reserve. But in normal times of heavy traffic, all demands must, however, be met. For this to be so, the stock must always be in advance of the requirements, and be brought up by regular train movements, so that when the boat arrives, the consignor only has to ask for stock as he wants it. He should not be required to state his needs in advance, since it is impossible for him to do so.

The President (in French). — This is a question of measure.

Mr. Gaeremynck. — It is very important from the financial point of view : it is a question of knowing whether it is necessary or not to purchase more wagons. If we admit the principle of a reserve of stock, the stock must be so estimated that, during normal heavy traffic, such a reserve can be counted upon. We must not content ourselves with forecasting the amount of stock strictly necessary in a « normal » period of heavy traffic, excluding any reserve.

The President (in French). — This word « reserve » is responsible for the remarks made. It implies an immobilisation of stock which is perhaps not necessary for covering the service. Might we not, since the Special Reporter asks for details, delete this word with its idea of immobilised stock ?

Mr. Stäckel (in German). — I should like to remind you that point 1 *b*) says that near markets, ports, etc. there should be available a reserve of wagons sufficient to provide the wagons needed. Such a reserve can only be made in periods when there is an abundance of wagons; at other periods appropriate measures must be taken to assure that the goods are conveyed in time.

Consequently I think that from this point of view some modification or suppression should be made.

The President (in French). — We might say : « Supplies of wagons for ports, industrial centres and markets should be so assured that consignors can be given the wagons they require without having to ask for them in advance. » Would this formula, worded as it is in general terms, meet the requirements.

Mr. van Rijckevorsel. — Yes.

The President (in French). — Mr. Stäckel's remarks might be reported in the minutes of the meeting, worded in the more precise fashion given above, and this formula might be subsituted for paragraph *b*) of point 1 of the summaries.

For the sake of completeness, we might satisfy our Polish colleague by inserting his proposal as paragraph *f*) after paragraph *e*) of point 3.

Mr. Apostolesco, Rumanian Railways (in French). — I would like to point out that in the summaries, no allusion has been made to the best method of calculating the turn-round coefficient. Various methods of calculating this coefficient have been mentioned, methods which not only differ from one railway to another, but which are not even comparable among themselves; I agree that it is impossible to enter into details about each formula, but some detailed study would seem to be necessary.

In the way in which they are set out, it is not possible to compare these formulæ with one another, as the turn-round of wagons, expressed in days, depends in the first instance upon the average distance worked. On railways on which the wagon mileage is small, for example in Belgium, this coefficient will of necessity be small, but on railways, like those of Germany, where the mileage is much greater, this coefficient will be much greater, without this being any proof that the respective operating method is less economical. The formulæ are consequently not comparable; for them to be comparable they must be worked up more fully, and the various elements of these formulæ must be separated from one another; in the formula for the turn-round of wagons, it is essential to state day by day the running time on the one hand, and the standing time on the other. *The ratio of these two coefficients, that of the running time and that of the standing time is of general application.* It eliminates the variable element of mileage, which varies from one railway to another, and *even over one railway system.* On the other hand, it enables us to work in a more exact and scientific way. The following is an example :

From the statistics supplied by the Rumanian Railways in the case of a wagon with a turn-round coefficient of 9.80 days, this coefficient is divided up into 8.41 days during which the wagon is stationary, and 1.39 days in which it is actually running, both loaded and empty, for a mileage of 400 km. (250 miles). This wagon only runs during 16 % of its time, the rest being absorbed by time spent standing for loading, unloading, shunting, etc.; this discrimination throws a new light upon the turn-round of wagons, and leads to more efficient working. Very simple formulæ have their advantage, as Mr. Tuz said a little while ago, but if the work is to be well done, the question must be gone into more deeply.

For this reason, I propose that we should mention, as an addition to the general summaries, that the Congress considers this discrimination as desirable in order to calculate separately the running time and the standing time. It may be objected that this method would be costly; but in reality it is possible to carry out such calculations without using any special form accompanying each individual wagon.

Each train, in practice, carries with it a waybill, giving the total tonnage, number of pairs of wheels, weight of each wagon, etc. By means of this data the factors required to break up the time can be calculated.

The German Railways have obtained good results over a given period and for a given number of wagons, by sending them out with special waybills. Our method is of a general nature and does not require any special bill with the wagons; it only requires summary sheets.

I propose, therefore, that the view I have already expressed be added to the summaries : that of recommending to railway administrations such formulæ as enable the turn-round coefficient to be divided up into its elements, so as to be able to determine separately the time the wagons spend in running and in standing. The ratio of these details gives the best idea of the efficiency of the wagons, and replaces in an altogether better way the wagon turn-round coefficient.

Mr. Gaeremynck (in French). — Mr. Apostolesco seems to attach great importance to the question of the distance worked. For my part, I think that the distance is a factor of relatively small importance. It is the number of shunts which matters. If we want to proceed in a scientific way, we must take into account very many considerations other than the distance, such as the number of shunts en route, the standing time required, etc.; thus in a country where there is an important port which accounts for a relatively large part of the traffic, the turn-round would be unfavourably influenced, because the wagons lose much time waiting for the boats to sail.

Mr. Apostolesco. — My statistics take all this into account.

Mr. Gaeremynck (in French). — There is also traffic with foreign countries to be considered; as soon as the wagons have left the country all control over them is lost, and the turn-round would in consequence be greatly influenced by the number of wagons loaded for other countries. A distinction must therefore be made between the turn-round on the railway itself, and the turn-round when the wagons are off the company's lines.

Finally, if we wish to proceed scientifically, we must also distinguish between the different types of wagons. I think I have shown that the question is not at all a simple one.

Mr. van Rijckevorsel (in French). — I agree with Mr. Gaeremynck. The different railways use different methods of calculation. I have not included them in my report, seeing that it was not possible to arrive at any common conclusion.

Mr. Direz (in French). — I also agree with Mr. Gaeremynck. I think that what is valuable is to control the turn-round. Is it useful, in fact, to compare one railway with another, especially if on some of them the question of distance is of very little importance ?

Let us take, for example, the Paris-Marseilles line. According to the organisation of the Paris, Lyons & Mediterranean Railway, the wagons run without intermediate shunting from Paris to Marseilles, whereas the wagon which starts from an intermediate station will run over a lesser number of kilometres and will undergo some additional shunts.

I agree that the calculation of the turn-round is very interesting. We know that the operations involved in working the wagons forward represent about 50 % of the total journey time. But what is interesting is to compare the railway system with itself, with the traffic on it. If a wagon is sent to a works, the wagon will be unloaded by it more quickly than if the wagon was sent to the country where we are obliged to advise the consignee by a much slower process, apart from the fact that the unloading methods are also slower.

I do not think that it is necessary to compare the railways with each other; they should be compared with themselves. The railway itself should see if it is pro-

gressing or dropping behind. In order to be practical, the turn-round must be controlled simultaneously in the large shunting yards, in the large loading and unloading stations. On the French State Railways, we have 23 stations in which daily control of the turn-round is carried out, and this control affects about two thirds of the wagons belonging to the railway, as it concerns the shunting stations.

It is obvious that an hour saved on the average time wagons remain in these stations is much more valuable than a day gained in the small stations where there is very little traffic.

I am speaking from experience. Each year, at the period when the traffic increases, we are obliged to reconsider our calculation of the turn-round. Our observations have enabled us to notice that the stations have become accustomed to work at a slower pace during the time of little traffic. We have therefore, every year, to recommence the instruction and the training of the staff in order to improve the output.

I consider, therefore, that if we add anything to our summaries it should be to indicate the value of controlling the operations, without going so far as to impose any uniform method of calculation on all the railways.

The President (in French). — Mr. Apostolesco's observations have then some practical bearing. It is recognised that a uniform method is not possible, but we are all agreed in saying that there should be a control.

Mr. Direz, whose summaries were considered a short time ago, also seems to be of the opinion that this suggestion should be adopted, but in vague terms bringing out the idea of this constant control at the main centres.

Mr. Apostolesco. — I will accept your interpretation.

The President (in French). — We might say : « The importance of the turn-round of the stock calls for constant control, particularly in the case of the large centres, so as to obtain... »

Mr. Apostolesco (in French). — « ... the minimum of standing, because the wagons must circulate ».

Mr. van Rijckevorsel (in French). — « ... a better coefficient of utilisation ».

Mr. Direz (in French). — « ... with a view to improving the coefficient of utilisation constantly ».

The President (in French). — « ... with a view to constantly improving the utilisation of the stock of wagons. The complete formula would therefore be : « The importance of the turn round of the stock calls for permanent control and in particular in the great centres, so as to improve constantly the utilisation of the stock of wagons. »

Mr. Tuz (in French). — I propose that we add to Mr. Direz's summaries : « The permanent control of the execution of the programme should be the basis of the calculation of the allocation plan » and in order to please our Rumanian colleague, we might add as a second point : « the average time the wagons stand in the sidings should be under constant control ». I think that it is necessary to say that the turn-round coefficients should be controlled; this is the first thing. The second, the most important, is the control of the time the wagons remain in the sidings both in the small stations and in the large centres. If this control is easy

to carry out in the first case, it is much harder in the large centres, and it would be useful if a practical formula on this subject were to be established.

Mr. Stäckel (in German). — May I add yet another word to Mr. Direz's remarks? In my opinion, Mr. Direz has raised an interesting point in saying that the head of the operating department should also control the turn-round of the stock. This opinion is not expressed in his summaries. I think it would be a good thing to adopt this conclusion as well.

The President (in French). — The summaries should be directed to the importance of the permanent control and the carrying out of the allocation programme. Mr. Stäckel suggests that we should mention the importance of the centralisation of the allocation services.

Mr. Savary, Swiss Federal Railways (in French). — There is one point in Mr. Direz's summaries which I would like to see modified. In the last paragraph which reads : « In case of heavy traffic due to seasonal or exceptional requirements, the quickness of the turn-round may call for exceptional measures, such as the formation of accelerated through trains (even if this acceleration results in reduced train loads), etc.... » I would like to see added : « ... as the formation of fast through trains within the limits of the economical use of the locomotives available ».

Indeed, if we have recourse to methods of traction which are not justified, the whole economy of the system is lost, and if this uneconomical utilisation leads to the purchase of new units, it becomes costly.

The President (in French). — It might perhaps be a good thing to introduce this idea. Mr. Direz has observed that to introduce the question of acceleration was a delicate matter. You are of the same opinion, and consequently we should modify the text.

Mr. Gaeremynck (in French). — As regards Mr. Savary's remark, I must say that it is possible to have a shortage of one class of wagon and abundance of another. We have periods of heavy transport of different kinds of goods. In Belgium for example, there is a shortage of flat wagons, but we have too many locomotives. This does not prevent us from making up trains with surplus wagons.

The President (in French). — The fact that you have at your disposal ample motive power is not a reason why we should introduce in our summaries the observation that, when a reduction of the load is asked for, the available power is not taken into account.

Mr. Gaeremynck (in French). — There may be a shortage of stock of a given kind, even when the traffic is generally small.

The President. — Then how is your remark to be worded?

Mr. Gaeremynck (in French). — If we take Mr. Savary's remark into consideration, we must show that in the case of particularly important traffic, the whole of the stock cannot be used unless we take the available motive power into account.

The President (in French). — We might say : « ... speeded up to a useful degree from the point of view of load and taking into account the motive power ». We must not forget the « motive power » element. Do you agree,

Mr. Direz, to modifying your summaries in this way : « accélérés dans la mesure utile et en tenant compte des moyens de traction » (« accelerated as far as useful and taking into consideration the available motive power ») ?

The Special Reporter does not see any objection to this.

Mr. Savary (in French). — Instead of the word « moyen » might we not say « economie » ? I will not however insist upon it.

The President (in French). — In my opinion the word « moyen » expresses all what we mean.

Mr. Direz (in French). — On a line with heavy passenger traffic the trains will run with difficulty. The speeding up of the service enables us to save engine time. The wording given is such as to satisfy everyone. Mr. Stäckel's remarks still remain to be considered.

The President (in French). — Mr. Stäckel recommends that the allocation service be attached to the train operating department.

Mr. Direz (in French). — That is also my opinion : the wagon controller must not be isolated.

The President (in French). — We might say :

« In view of the importance of the quick turn-round of wagons, it is recommended, on the one hand, that the allocation of wagons should be linked to the service in charge of the goods train running and, on the other hand, a permanent control should be exercised on the way the allocation programmes are carried out, or on the operations at stations with intense traffic, in order to constantly improve the efficiency of the rolling stock. »

Mr. Gaeremynck (in French). — In the second paragraph of the text of Mr. Direz, it says : « When this constancy is noticed... »; might we not say : « In the numerous cases where this constancy... » ?

The President. — That is a sort of recommendation.

Mr. Direz. — I agree with Mr. Gaeremynck.

The President (in French). — We might say in a general way « *In the numerous cases* ». If you agree, we might, if the Section will leave it to us, adjust the sentence in question. *(Agreed.)*

As no objection has been raised, we will consider everyone is agreed, and thus terminate our discussions for today.

Mr. Gaeremynck (in French). — May I make a further observation on the subject of the summaries of the Special Reporter, which we have decided to replace by the new general summaries.

The President. — Is this to be mentioned in the minutes of the Meeting?

Mr. Gaeremynck (in French). — In paragraph *f*) of point 1 and paragraph *e*) of point 2, the idea expressed is that charges be imposed to ensure the wagons are made good use of. Errors are sometimes committed in this direction. Through a certain lack of comprehension on the part of the commercial departments, the stock is not made good use of, whereas the charges imposed should lead to just the contrary result. The benefits of reduced rates should never be subordinated to the supply by the railway of wagons of a given type.

At the present time, the rates apply to a minimum of 5 tons in a 10-ton wagon. Now with certain goods, such as corks, it is not possible to get more than 3 tons in these 10-ton wagons. But we have some wagons of greater capacity, the German « Hohlglasswagen ». In some of these wagons there is room for 5 tons of corks instead of 3 tons. The consignor who gets such a wagon can load 5 tons and will pay the same rate as another client, using another kind of wagon, pays for loading 3 tons. This shows that it is wrong to require a minimum load greater than the load a wagon can normally take. I wanted to make this observation in order to be able to insist that such rate regulations are bad for the allocation of stock, making it necessary to look for and bring up special stock, when ordinary stock is at hand or nearby.

Mr. Direz (in French). — I agree with Mr. Gaeremynck, and would like to quote another example. I have asked that the rate on the transport of apples be increased. On the French State Railways when 72 000 wagons were being used to transport apples we observed a very interesting fact. In Germany there are many 20-ton wagons. With the rate per loaded wagon of 10 tons we have recorded increased loads. 20 000 wagons have an average load of 11 tons; they come from Germany. The others are used in internal traffic. We find that the average load in 5.5 tons. Through the influence of the rates there can be a saving of 50 %. I asked for a rate per wagon loaded to 10 tons.

The President (in French). — We will note these remarks in the minutes of the Meeting, so as to be able to make use of them.

Mr. Mermont, Est Railway, France (in French). — The allocation and the turn-round of the rolling stock appears to have been studied in the reports more especially in the case in which the stock corresponds more or less to the traffic needs, or is insufficient; there are, particularly in the latter case, certain difficulties to be overcome, and the proper steps to remedy this have been looked for.

But there is another case which also is not without interest, which we are experiencing at the present time in France, and which other countries also, I think, must be experiencing, because of the crisis : that is when the stock of a railway is appreciably too large for the traffic needs. Contrarily to what might be expected at first sight, such a situation does not facilitate the work of the railway. It might perhaps be as well to indicate also what should be done from the point of view of the turn-round and the allocation of rolling stock in such a case of excess stock.

A solution, which might be qualified as a lazy one, is to send the excess stock towards one or several large general holding stations from which it can afterwards be distributed as required. But there is also another which consists, before the available stock is thus concentrated, in making a reserve in the stations of the railway system of certain wagons of types fitted to the traffic dealt with by them, and subsequently maintain these reserves automatically. This method has the following advantages : In this way the consignor is supplied with the wagon as soon as he asks for it, without any delay : this rapidity is not to be disdained at the present time of road motor competition, when there is a tendency to criticise the railway for excessive delays.

Savings in motive power and time are made relatively to the solution of sending

the excess vehicles without distinction to a general holding station, from which they can afterwards be taken back into service.

Obviously, such a method is, in my opinion, only applicable in the case of excess stock; as soon as the situation tightens up, the wagons, should no longer be left at the disposal of the stations, and the allocating office must take over entirely the distribution of the stock.

The President (in French). — I have always recommended that wagons should not be sent to a general holding station in an unconsidered fashion. The possibility ot utilising this stock in the station itself must be considered.

Mr. Gaeremynck (in French). — If I understood rightly, Mr. Mermont says that the wagons should be distributed among all the stations. I do not agree with him, and I think that the wagons should be sent to the stations that use them.

Mr. Mermont (in French). — In my opinion wagons should only be kept in « active reserve » in stations where the traffic justifies such a measure.

The President. — Mr. Gaeremynck thus makes a reservation as regards the wagons that can be made use of in the stations.

Mr. Gaeremynck (in French). — I wanted to stress the fact that there are stations which receive large numbers of loaded wagons and that it is not to such stations that excess stock should be sent for stabling.

The President. — We will include this remark in the minutes of the Meeting.

Are there any other observations?

(No one else wished to speak.)

We will therefore end our summaries with a last paragraph worded as follows :

« In view of the importance of the quick turn-round of wagons, it is recommended, on the one hand, that the allocation of wagons should be linked to the service in charge of the goods train running and, on the other hand, a permanent control should be exercised on the way the allocation programmes are carried out, or on the operations at stations with intense traffic, in order to constantly improve the efficiency of the rolling stock. » *(Agreed.)*

We have now finished our work for today.

— The Meeting ended at 11.30.

DISCUSSION AT THE PLENARY MEETING

held on the 30 January 1933 (morning).

H. E. IBRAHIM FAHMY KERIM PASHA IN THE CHAIR.
GENERAL SECRETARIES : Messrs. P. GHILAIN, YOUSSEF RISGALLAH BEY, Dr. I. G. LEVI and FOUAD HASSIB BEY.
ASSISTANT GENERAL SECRETARIES : Sir HENRY FOWLER and Mr. P. WOLF.

Mr. Ghislain, *General Secretary.* — We will now examine the summaries adopted by the third Section as regards Question VII. These summaries appeared in No. 2 of the *Daily Journal of the Session.*

(The summaries are then read to the Meeting.)

The President. — Are there any objections?

Mr. Margot, Permanent Commission of the Association and Paris, Lyons & Mediterranean Railway. — A material error has crept into the third paragraph of the summaries. I will read it again : « In this order of ideas, advantage can be taken of the relative constancy of traffic needs and the supply of wagons. »

The next sentence begins as follows :

« In the large number of cases where this constancy has been noticed... » It should read : « In the large number of cases where this constancy is noticed... »

(Adopted.)

— *No other remark was made.*

The President. — The summaries of Question VII will consequently be considered as adopted with the alteration indicated by Mr. Margot.

Summaries.

« The reports presented to the Congress « in respect of the allocation of goods « wagons show that in a general way the « Railway Systems are inclined towards « the same solutions, with certain pecu- « liarities depending on the traffic re- « quirements.

« What is interesting in the matter is « the tendency towards a scientific or- « ganisation of the allocation with the « object of reducing the period of turn- « round of wagons and of increasing « the efficiency of the available stock.

« In this order of ideas, advantage can « be taken of the relative constancy of the « traffic needs and the supply of wagons. « In the large number of cases in which « this constancy is noticed, it is possible « to set up a system of allocation com- « prising permanent orders for the direc- « tion of currents of empty wagons, sup- « plemented in view of important supplies « by other orders varying in accordance « with the traffic requirements. Such a « plan should embody an appropriate « organisation of a train service allowing « as speedy a despatch of wagons as pos- « sible, while serving at the same time « the stations with intense traffic at suit-

« able hours for delivery and collection « of wagons.

« The formula for centre-stations re- « commended in the summary of Ques- « tion VIII regarding the grouping of « parcels comes within the scope of this « organisation of through trains.

« The improvements made in the tele- « phone service in the form of « dis- « patching systems » can be used with « advantage for the rapid circulation of « through trains of empty and loaded « wagons.

« Standardisation of the types of wa- « gons, towards which the efforts of « the Railways are directed, tends to « simplify the operations necessary for « the allocation of wagons, and to reduce « the empty running and consequently « to decrease the period of the turn- « round of wagons.

« In case of heavy traffic due to « seasonal or exceptional requirements, « the quickness of the turn-round may « call for exceptional measures, such as « the formation of through trains accel- « erated as necessary, taking into con- « sideration the available locomotive « power, the despatch of empty wagons « by the quickest way by giving them « priority, and the increase of shunting « facilities at the stations.

« In view of the importance of the « quick turn-round of wagons, it is re- « commended, on the one hand, that the « allocation of wagons should be linked « to the service in charge of the goods « train running and, on the other hand, « a permanent control should be exer- « cised on the way the allocation pro- « grammes are carried out, or on the « operations at stations with intense traf- « fic, in order to constantly improve the « efficiency of the rolling stock. »

[656. 212 & 656. 225]

QUESTION VIII.

Organisation for carrying small consignments of goods and the most suitable methods for their delivery with the least delay. Use and selection of fixed and mechanical transhipping plants.

Preliminary documents.

1st report (Belgium, France, Spain, Holland, Portugal and their Colonies, Switzerland, Denmark, Finland, Luxemburg, Norway and Sweden), by Messrs. HAUTERRE and MERMONT. (See *Bulletin*, June 1932, p. 907 or separate issue No. 13.)

2nd report (all countries except America, Great Britain, Dominions and Colonies, China, Japan, Belgium, France, Spain, Holland, Portugal and their Colonies, Switzerland, Finland, Luxemburg, Norway and Sweden), by Mr. C. FETTARAPPA. (See *Bulletin*, May 1932, p. 621, or separate issue No. 6.)

3rd report (America, Great Britain, Dominions and Colonies, China and Japan), by Mr. E. MINSART. (See *Bulletin*, September 1932, p. 1777, or separate issue No. 27.)

Special Reporter : Mr. HAUTERRE. (See *Bulletin*, January 1933, p. 93.)

DISCUSSION BY THE SECTION.

Meeting held on the 21 January 1933 (morning).

Mr. MARGOT, PRESIDENT OF THE 3rd SECTION, IN THE CHAIR.

— The Meeting is opened at 9.30.

The President (in French). — We have to discuss Question VIII today. I will ask Mr. HAUTERRE, the Special Reporter, to read us a resumé of his report and the summaries he has drawn up.

Mr. Hauterre, *Special Reporter*, then read the resumé given on pages 113 to 115 of the January 1933 *Bulletin* (special Report) and then the summaries, the text of which is as follows :

The organisation for the conveyance of parcels consists of two main parts, viz., conveyance by *rail* and the auxiliary conveyance from the sender's premises to forwarding station and from receiving station to the consignee's premises.

As regards conveyance by rail an endeavour has been made in this report to bring out what has already been done by the railways to improve the transport of parcels and an indication has been given, in the résumé, of the agreed conclusions drawn from our own investigations and those of our colleagues.

One point, however, deserves emphasis, viz., the desirability of substituting for the multitude of forwarding and receiving stations a limited number of well-chosen centre stations each for a zone of about 30 to 40 kilometres (20 to 25 miles) radius which would constitute the actual *rail* forwarding and receiving points for parcels.

By thus concentrating all the parcels of a zone at the central forwarding point, the railway would more easily realise all the conditions necessary for loading numerous full wagons or grouped consignment wagons for direct and rapid transit to the receiving centre-station of the destination zone.

Moreover, it should not be overlooked that the superiority of the road motor is due above all to the *convenience* afforded to the trader by removing the necessity of arranging for the cartage of his traffic at the forwarding and receiving ends.

The efforts of the railway ought therefore to be in the direction of so organising its services as to make it advantageous for a road motor accepting goods from sender's premises for a distant destination more than, say, 50 to 60 km. (30 to 40 miles) away, to use the railway for the main part of the journey.

To obtain this result, i. e., to bring to the rail all medium and long-distance traffic, it is essential for the railway to resolve the two questions of *rates* and *time*.

As regards rates, a simple basis derived from road motor practice (wagons hired to agents grouping consignments, and charged for empty or loaded haulage at a flat rate per kilometre or mile) appears to be particularly worthy of recommendation. It would likely induce these agents to discard road-motor conveyance in favour of placing the traffic on rail at the forwarding zone centre station for conveyance to the destination zone centre-station, labelled to an agent responsible for distributing the parcels to the consignees, and would also give them an incentive to find a return load.

A system of charges of this kind has recently been proposed in France by the main line railways. The fixing of the basic charge in this system is of course governed by the net cost by the road motor and consequently may vary from country to country. (The rate contemplated by the French railways for a 10-t. (9.8 Engl. tons) wagon is 3 francs per km. (5 fr. per mile).

With respect to *time*, the total duration of combined transit (road-rail-road) must not exceed the time taken for throughout conveyance by road. With this object in view the railway should :

a) carefully co-ordinate at each centre-station the arrival of the collecting lorries and the departure of the parcels wagons, and, vice versa, the arrival of the parcels and the departure of the delivery lorries.

In practice, as collection will be effected towards the end of the afternoon, the departure of the wagons should take place in the evening, so as to get the advantage of the night period immediately following acceptance of the goods.

At the destination points, the wagons should arrive early enough to enable the delivery lorries to leave first thing in the morning.

b) speed-up as much as possible, by specialisation, the trains conveying wagons of parcels. Each line should be served daily by two trains, a distributing train in the morning and a collecting train in the afternoon. These trains should be lightly loaded, and would only stop at the centre-stations.

The risk, on railways where the ordinary and fast services co-exist, is that traffic will pass to the former from the latter, but there is no doubt whatever that this is far preferable to losing the traffic altogether.

A last point requires to be dealt with. It has already been indicated how, with reduced (wagon-kilometre or wagon-mile) rates, groupage agents may be induced to make up

full wagons for conveyance between districts having a large regular and balanced flow of traffic between them. But how are these agents to be persuaded to bring to the centre stations the small separate parcels consignments which cannot be loaded in a full-load wagon? In our opinion, one solution which may be considered — except of course in places where the railway itself collects and delivers — is to give agents a bonus on all consignments brought to a centre-station for conveyance by rail at the high standard rates applicable to small parcels.

Finally, to repeat the final conclusions of our Report No. 1, it would appear that if the railways wish to prevent their parcels traffic from disappearing and to recover the traffic already lost, they must so organise it that it can be conveyed from door to door very quickly and at suitably adjusted rates, by road-rail services in connection with a system of centre-stations as described above, designed to encourage the groupage of parcels traffic. According to circumstances, the railway may either effect the whole of the combined carriage itself, or leave to private undertakings in competition with each other, or to a particular agent, the collection and delivery of the parcels traffic by road motor in the districts served by the centre-stations.

The President (in French). — I wish to thank the Special Reporter for his excellent report. He has given a very exact summary of the interesting ideas to be found in the reports drawn up by Mr. Mermont and himself, by Mr. Fettarappa, and by Mr. Minsart.

We will now pass on to the general discussion, keeping in mind what was done yesterday when Question VII was discussed. We can begin by seeing if there are any observations to be made on the resumé and the summaries which have just been read. Yesterday, once this preliminary work had been done, we found that on two points there were remarks and an addition to be made. The alterations were the outcome of the discussion. I think, therefore, that it is logical to reconsider what has been read, and ask ourselves if any modifications should be made. If there are none, we will finally draft the resumé, retaining any points which may be of interest to the Congress.

Therefore I suggest that we should act in the same way as regards Question VIII, that is to say we should not retain, as points to be submitted to the Congress, those things which are already in practice on all the railways.

We need originality in our summaries. We should only retain the new things, which we can recommend. Mr. Hauterre followed our discussions yesterday, as well as the Gentlemen present. He approved of this policy, and has suggested to me summaries much simpler in form than those inserted in his report.

After the new statement which the Special Reporter will read to you, I suggest that you consider if there are any observations to be made so that a general report, can be properly drawn up, the outcome of which will be our summaries.

Has anyone any suggestion to make on the resumé and the summaries of the Special Reporter which have just been read?

Mr. Fettarappa, *Reporter* (in French). — It would be interesting, in my opinion, to mention a new method of dealing with the exchange of parcels between two stations in the same city. I have heard that this method is in use in Paris, and also in Germany. In Italy the question is under investigation. It would be a good thing to lay down as definitely as possible that the transfer of parcels in the same town should be done by means of motor lorries instead of by rail wagons, the transfer of which is so much slower and complicated.

The President. — Where do you wish this addition to be inserted?

Mr. Fettarappa. — In any part of the summaries.

The President (in French). — We will consequently leave it to Mr. Hauterre to insert this point where he thinks most suitable.

Do you agree to this, Mr. Fettarappa?

Mr. Fettarappa. — Yes.

— The Meeting decides that Mr. Fettarappa's suggestion shall be the subject of an additional paragraph placed after paragraph *a*) of the summaries of the special report (page 116 or this report). This new paragraph will be worded as follows :

« *b*) In order to facilitate the exchange of parcels between the different local stations in large cities, it is recommended to substitute motor lorries for railway wagons, as the transfer of wagons is particularly laborious. »

Paragraph *b*) of the special report consequently becomes paragraph *c*).

Mr. Minsart, *Reporter* (in French). — I have a remark to make about the Special Reporter's proposal in connection with the creation of centre-stations. He insists (page 116) on the value, from the point of view of the railway, of substituting, for the multitude of despatching and receiving stations, a restricted number of centre-stations. To support this suggestion, I might point out that something of the sort is already in existence.

Mr. Hauterre (in French). — The suggestion does not apply to any particular stations, and there is, moreover, the question of the rates.

Mr. Minsart (in French). — In my report I pointed out that certain railways have already an organisation of a similar kind, particularly the Irish railways. I mentioned this organisation on page 1785 of my report (1). As it is actually working and its extension is under consideration, I think it useful to mention it.

The President (in French). — I agree that Mr. Minsart's remark must be taken into account. The Special Reporter's text, in paragraph 3 of his summaries, should therefore be altered to mention that such an organisation is already in existence : it would meet the case if we used the present instead of the conditional.

Mr. Savary, Swiss Federal Railways (in French). — A similar system has been tried for a year in Switzerland, and will be extended.

The President (in French). — We will, therefore, also mention the Swiss railways, leaving it to Mr. Hauterre to modify the text in question, as well as to introduce the addition suggested by Mr. Fettarappa.

Mr. Tuz, Polish State Railways (in French). — Mr. Fettarappa has indicated in his report that some railways are making use of a system of premiums, based on the output and the quality of the work. We read, in effect, in the 3rd paragraph of page 659 of his report :

With a view to obtaining rapid handling of packages, some railways grant special bonuses or gratuities, based on the production and quality of the work done, to the employees appointed to do this work.

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(1) See *Bulletin of the Railway Congress Association*, September 1932.

I would like to remark, in this connection, that the Polish railways pay premiums to the staff in order to ensure that the wagons loaded with parcels are always used to the best possible extent. I may add that this method has given good results.

I suggest, therefore, that in the Special Reporter's summaries it should be stressed that premiums are a very good way of assuring that wagons loaded with parcels are efficiently employed.

The President (in French). — I agree with Mr. Tuz that this idea should be made the subject of a special paragraph. It is, in fact, a new idea, and I propose to leave it to Mr. Hauterre to make the necessary modifications.

Mr. Tuz. — Agreed.

Mr. Gaeremynck, Belgian National Railways Co. (in French). — The Special Reporter has pointed out, as regards arriving at the cost of transport, that this calculation of the price is affected by the cost of transport by road motor. The cost in the case of motor traffic is fictitious, because the railways pay the whole of the charges falling on them, whereas the motor does not.

It must, therefore, be agreed first of all that the Government should do what is necessary to make the burden equal, and so prevent the cost prices being falsified, as otherwise competition becomes impossible. This is a question of public interest.

I agree that we should say that the cost price should be reduced as far as possible, but it is just as important, from the point of view of the charges borne, to do away with the disparity of treatment.

I will not, however, stress this point more, as these ideas have already been gone into when discussing the question of motor competition.

The President (in French). — This suggestion ought also to be kept in mind. I have already looked into the matter, but it seems to me that the cost should be specially stressed in the summaries on the question of motor competition.

The matter is, moreover, a very interesting one, as if the prices are lowered to meet motor competition, quite useless effect may be produced; the result may be economically disastrous from the national point of view. We will report this observation in the minutes of the Meeting and will return to it for investigation when discussing the question of motor competition (*Question XI*).

Mr. Sommier, Somain to Anzin and the Belgian Frontier Railway, France (in French). — As regards the cost price of motor transport, it is difficult to appreciate the question accurately as most motor undertakings still make up their costs empirically. It is generally known how the thing is done : the haulier buys a motor vehicle on credit; it runs for one year or two; then the haulier finds business bad, so he looks around for a purchaser to take the vehicle off his hands, and things go on as well as possible.

I have a feeling that the road haulier does not ascertain his operating costs; he tries to get hold of traffic without ascertaining if he is making a profit or not; this moreover also explains the frequent changes in ownership.

The President. — This corroborates what has just been said. We will note it in the minutes, and we will deal with it when discussing Question XI.

If there are no other observations, we will take Mr. Hauterre's report, with the

amendments made to it, as finally agreed. *(Approved.)*

I will now ask Mr. Hauterre to sum up for us, in the way suggested at the beginning, the proposals to be retained, and to be recommended, in the summaries, which must be as concise as possible.

Mr. Hauterre (in French). — The first point which emerges from the reports is that the parcels traffic is threatened by motor competition — this is perhaps the most vulnerable point — and the railways must constantly be on their guard to defend this traffic against the said competition, which is extremely active. Among the means which enable this to be done, I think we should consider transport by rail and transport from one station to another, at departure and on arrival. As regards transport by rail, it appears that among the methods to be made use of, that known as the « Leichte Stückgüterzüge » established in Germany and that called the « treni rapidi collettame » made use of in Italy, are likely, as Mr. Fettarappa also points out, to give good results.

The President. — Do you propose to mention this in the general Summaries?

Mr. Hauterre. — Certainly.

On the other hand, the creation of centre-stations, instead of a multitude of receiving and despatching stations, seems to me a good thing, as it simplifies bringing up wagons and transhipment and makes it possible to concentrate wagons fully loaded for long distances.

I will therefore also retain the idea of setting up centre-stations.

The President (in French). — This system is, moreover, already used in Switzerland and Ireland, as we have just been told.

Mr. Hauterre (in French). — This idea of centre-stations being retained, we may ask ourselves how the parcels can be concentrated within the zone of this centre-station, and be worked from the centre-station to the secondary station, and vice-versa. Apart from the motor services of which we shall speak, we can retain the idea of working them from the centre-station towards the secondary stations by means of rail motors working at low cost and even in certain cases by means of shunting engines, such as locotractors.

I will therefore mention, in the general summaries, this idea that the linking up of the stations can be covered by means of light rail cars and shunting engines.

The President (in French). — We will see if there are any observations. We might in any case mention these ideas.

Mr. Hauterre (in French). — There is also the idea of the convenience of motor traffic from the point of view of the consignor and consignee by picking up and delivering the parcels at their premises. I think that this idea of the convenience of the road motor is one of those which the railway should try to emulate, so that it can offer the public equal facilities.

I have also briefly considered the use of containers, and I think that this idea might be stressed when it is a question of parcels not sufficient to fill a wagon, as in the case of international transit.

The reports have shown that, in certain large cities, receiving offices have been set up which give the public equal facilities to those offered by the road motor services. These receiving offices enable individuals to take their parcels to places more accessible than the large stations. This idea of multiplying the number of places where parcels can be

handed over is to be retained. The cartage services should work between the railway and the consignor's premises in order to give door to door services.

The services thus set up should, for the reason which necessitates their establishment, be equipped on up-to-date lines; they must be flexible, speedy, and able to make several collections a day. Town offices have in fact been found in some instances to be a cause of delay in the despatching of parcels, particularly express parcels, because parcels were not collected from the offices frequently enough for them to be sent forward by the different trains.

When speaking of cartage, it must be noted that a really modern and simple method must be chosen, to make it possible to despatch the parcels quickly.

An idea which also might be noted is that of the simplification of the cartage rates. The public is as a rule dissatisfied when it cannot find out in our notices the rates in the large towns, particularly as the rates vary. If a uniform cartage rate were charged, such as class A for the large cities, and class B for the average size towns, the public would be able to see that the prices are uniform according to the importance and size of the town, and these rates would therefore be better understood. This idea also might be kept in mind.

I should also like to see mentioned in the general summaries the rating system suggested by the French railways. This system is based on the rating system of the road motor services : i.e. the rates depend upon the wagon-kilometre. The idea is as follows : we hire out wagons to a collector, either a trader or manufacturer, for a minimum period of three months. The hired wagons can be fitted up to meet the needs of the particular traffic, and the wagons despatched are charged according to a very simple rate of 3 francs per kilometre. We adopted this rate of 3 francs because the working costs of a 5-ton lorry amount to about this sum.

Such an organisation assures the recovery of very competitive traffic. This rating method also has the great advantage of inciting the hirer of the wagons to arrange for return journeys under load.

Finally, we might mention a somewhat novel idea, that of encouraging the staff to act on the public. This fits in with the idea of premiums already mentioned. The staff should be taught the idea of retaining existing traffic and of looking for new traffic; they should be inspired with a more commercial spirit which will fit in better with the requirements of the service, so that they may more clearly understand the general economy.

The President (in French). — Mr. Hauterre has just given us a complete summary of the basic factors for the elaboration of the general summaries; we therefore think it well to retain the solution applied by the German State Railways and the Italian Railways for the rapid transport of parcels. The Special Reporter wants to see the multiple stations replaced by centre-stations, indicating the part that should be played by the latter, as well as the idea of grouping the parcels at the centre-stations by means of transport depending upon shunting engines and rail motor vans. He personally insists more on the question of collecting parcels from the consignor's premises than on their delivery. Actually, when parcels have to be forwarded, the nearest office is always wanted, and if a railway vehicle comes and collects the parcel from his very house, the customer will remain more faithful to the railway. This idea of collecting from premises seems of

value, and is the result of the question of convenience, which up to the present has not been sufficiently considered. This is proved by the fact that we have not sufficiently advantageous rates; our idea has always been to make our services paying concerns. When we had a monopoly such a mentality was understandable; but it is no longer so.

There is also the question of the setting up of receiving offices and as the Special Reporter has pointed out it is a good practice to multiply such centres in the large towns. In France we have offices set up all round the town, under the care of a manager. The number of depots might well be increased. In France there are plenty of wine retailers and it might be a very economic solution to make use of these.

The Special Reporter insists upon the question of collecting goods from the consignor's premises and he adds it is a means which in his opinion is likely to attract the public towards the railway; he alludes to the simplification of the rates and their unification. His object is to enable the consignors to calculate the rates easily for any locality.

Speaking of the rates, the Special Reporter mentioned a formula developing the French suggestion of the wagon-kilometre.

I think I have summed up all Mr. Hauterre said, and that we might now ask those who have had practical experience of these questions at first hand to put forward any new ideas or tendencies they think it useful to mention.

Mr. Savary, of the Swiss Federal Railways, has been very closely concerned with these questions. I should like to know if he has anything new to tell us about them, which we might eventually mention in the summaries?

Mr. Savary (in French). — As I have already said we have for the space of one year made use between Winterthur and Romanshorn of a special organisation for transporting parcels traffic called *Asto*; this service acts very satisfactorily. Because of the results it has achieved, we are going to start another section, Geneva to Lausanne, which is crossed by a great number of secondary lines. This will be an interesting experiment. What will be the results of this system and how will it affect the secondary railways and motor transport undertakings? Only experience will show how much of this method of co-ordinating transport should be retained.

The President. — What precise mention can be made of this innovation in the general summaries?

Mr. Savary (in French). — The object of this Swiss organisation is to transport, by means of motor lorries belonging to private firms, parcels from the traffic centres to the intermediate stations and vice-versa, and at the same time to assure the cartage services for places near the railway. Such an organisation tends to speed up transport, by relieving the railway of the short-distance traffic which is very expensive for it to carry out. The wagons used in parcels traffic are now only loaded and unloaded in the traffic centres, and so we get a better output from them.

The President (in French). — Might it not be said, as regards the centre-stations, that the best system appears to be that used in Switzerland under the form of distributing stations worked with motor lorries, and that this system has given such good results that the Swiss Federal Railways have decided to extend its use.

Mr. Savary (in French). — I might add that we are under contract with a private road transport undertaking for the hire of motor lorries and drivers. These lorries must only be used for the co-ordinated traffic as laid down in the contract, and in this way are not available for competitive working.

The President (in French). — The idea developed by Mr. Savary thus supports the suggestion of centre-stations. The wording as regards the centre-stations is a general one : we might put the additional remarks in a separate paragraph.

I will now ask Mr. Hauterre to read us the projected summaries he has prepared; we shall then be better able to judge if certain additions or modifications will eventually have to be made to them.

Mr. Hauterre. — The text of the summaries I have drawn up is as follows :

The reports presented to the Congress on the subject of the organisation of parcels transport bring to light the efforts made by the Railway Companies towards a better service of ordinary and fast goods transport with the object of improvements called for by the necessity for retaining this traffic, which is being strongly disputed by automobile competition.

The President (in French). — The idea that motor competition must be kept in mind has been introduced because it is here especially that traffic suffers from competition.

Mr. Hauterre continues reading :

Many points arise out of the various measures taken or suggestions put forward in respect of rail transport, and complementary transport from the premises of the sender to the despatching station and from the arrival station to the consignee's premises.

First of all, for the rapid transport of parcels by rail must be borne in mind the solution by the employment of light trains, inaugurated on the Deutsche Reichsbahn under the title of *Leichte Stückgüterzüge* and known on the Italian State Railways as *Treni rapidi collettame.*

Alternately, it may be advantageous to substitute for the multitude of despatching and receiving stations a limited number of centre-stations, commanding operating zones of some extent and constituting principal points of departure and arrival for rail borne parcels traffic.

The President (in French). — I think this would be the best place to mention the experience of the Swiss Railways, by saying that the centre-stations are linked together by road motor services.

Mr. Gaeremynck (in French). — Did you say, Mr. President, that the centre-stations are linked up by motor services?

The President (in French). — The transport is carried out by railway from one centre-station to another, but the distribution is done by road.

Mr. Hauterre (in French). — Mr. Savary has just said that the Swiss Federal Railways are in competition with both road and railway.

Mr. Gaeremynck (in French). — Actually, for collecting and distributing the parcels in the district there is a motor lorry service based on the centre-station.

Mr. Savary (in French). — Yes, as far as the railway interests allow.

Mr. Gaeremynck (in French). — Ought we not to say that concentration of the traffic is carried out by rail motor vans or shunting engines, and ultimately by road motor lorries. We should distinguish between the concentration of traffic and the distribution thereof.

The President (in French). — Would it not be better to say nothing, since in Switzerland it is a question of a quite particular system?

Mr. Gaeremynck (in French). — The fact is that the motor lorry has been substituted for the railway.

The President (in French). — In principle, transport from one centre-station to another takes place by railway, and I thought it would be a good thing to mention the Swiss solution in a special paragraph because in this case the railway is used between one centre-station and another, but in certain cases the road motor is used.

Mr. Savary (in French). — Normally the transport from one centre station to another is by railway. It is only carried out by road under exceptional circumstances, when it is a question of special or express transport, at a time when it is not possible to make use of the railway.

Mr. Gaeremynck (in French). — If you have to make use of the road motor service from one centre-station to another, you condemn the railway!

Mr. Savary (in French). — Not at all, as these are exceptional cases.

Mr. Gaeremynck (in French). — We should try to bring the traffic back to the railway. But if the road motor is substituted for the railway, you are doing exactly the opposite.

Mr. Savary (in French). — It is not always possible to fight competition effectively by the railway. The motor lorry is undeniably more up-to-date in many instances. There are cases when the general interest makes it necessary to co-ordinate the rigidity of the railway with the flexibility of the motor lorry.

The President (in French). — Traffic must be brought back to the railway only when this is to the interest of the railway. If you take the journey from Morze to Lyons, for example, it is not worth while to make use of the railway for a distance of 10 km.

The journey will be made by a service which saves time by going direct by road without passing through the centre-station. The dominant idea in this case is that the railway should take away from the motor its very *raison d'être!*

Mr. Savary (in French). — The division of the traffic and the relationship between railway and road should be laid down by law.

The President (in French). — It seems to me that it would be useful to mention the Swiss case, especially because it differs from that of our summaries in which the dominant idea is railway transport. The Swiss method is to have recourse to the motor in the case of certain traffic, and this is the reason for mentioning it in the summaries. It also seems to me that this is not contrary to the practice of other railways, seeing that in the case of certain lines it has been judged better to substitute the road motor for the train. On certain railways, road motors are now used because the stations do not serve the districts properly, and competition is impossible in these circumstances.

All possible combinations should be investigated in the interest of the railway. Switzerland makes use of the road motor to bring goods to the railway; we have here collaboration with the road motor, which prevents the latter from competing against the railway.

Mr. Hauterre (in French). — One point in this organisation of centre-stations bothers me. If the road motor is to be used because the railway cannot do the work, this appears to me to signify that there will never be a return to the railway.

The President (in French). — By means of the road motor you bring back the traffic to the railway. The railway is no longer obliged to be merely railway, as it was formerly; nowadays it must make use of the road motor.

Mr. Hauterre (in French). — Transport from centre-station to centre-station ought to be carried out by railway, but in the case of transport from one station to the next by railway, we are not always equipped to meet competition effectively.

Mr. Savary (in French). — The centre-station is the centre of a circle, a point of centralisation. To feed it, there must be a motor lorry service organised by the railway to bring up the traffic to the centre-station from which it will proceed by rail.

The President (in French). — These summaries, in fact, are of a general nature, and it seems to me that in order to sum up this discussion, without disparaging the centre-station which implies railway transport, we might mention the particular case of Switzerland, as we have here a solution which has been found to be satisfactory. I suggest therefore that the text in question be revised, and the revised version will be submitted to us for appreciation; we will include the idea of the light German trains, and the Italian services; there will also be the question of the centre-stations with the example of what is done in Switzerland. We will now go on to the question of supplementary transport, and I will ask the Spe-

rial Reporter to read the text referring to this matter.

In regard to complementary transport, it is essential that the railway endeavours to realise, as far as lies in its power, the convenience that the automobile service offers to the public, especially door-to-door transport.

The use of containers for groups of packages, which cannot fully load a wagon, has constituted an improvement; this should be followed up and extended, especially in international traffic.

For single packages, the system should be developed of collection at private houses and at receiving offices, the number of which should be increased in the big towns. This programme may be carried out either by Express Companies making use of the railway or by the Railways themselves, by means of lorries equipped in an up-to-date manner, in order to meet the demand for greatest rapidity both in transport to the station and delivery on arrival.

In this respect it is useful to unify, on any one System, the scale of cartage charges, with a view to facilitating the task of the public, always worried by the complication of documents.

With the same object in view, it may be advantageous to look for new formulæ for rate making, based on the practice of the automobile services. For example, when hiring to Express Companies, Factories, or Merchants, wagons to be transported, whether full or empty, on a kilometric basis, the senders would come to prefer the use of wagon and rail transport to transport by lorry. The Express Company would have a representative in charge of the distribution of the packages to the consignees, and would, moreover, be induced to canvass for return freight.

To sum up, every means should be employed to enable the Railway to render the services that the automobile offers to the public, not only by modernising its methods but also by encouraging its employees to influence the public in such a manner as to

retain and secure traffic and to direct the minds towards a more exact comprehension of the general economy.

The President (in French). — The text which has just been read to us sums up the ideas of the Special Reporter according to the method adopted when discussing Question VII, which consists in only retaining in the summaries the interesting points, leaving out what is already known to everyone.

I will now ask Mr. Stäckel to read the German translation.

— Mr. Stäckel translates into German the summaries presented by the Special Reporter.

— The English translation is then read.

The President. — I will now read you the text, modified by the Bureau, of the paragraph on which we were not able to agree just now. Here it is :

« Alternately, it may be advantageous to substitute for the multitude of despatching and receiving stations a limited number of centre-stations, commanding operating zones of some extent and constituting principal points of departure and arrival for rail borne parcels traffic, the connections between the centre-stations being maintained by rail. »

I think that, worded in this way, the paragraph will meet everyone's wishes.

I will continue :

« The object is to group the elements for making up full wagons or groups, the transport of which must be effected rapidly. The concentration of packages at the centre-station or the distribution at the secondary stations may be carried out either by road lorries or by rail cars designed in such a way as to make economical transport, or even by means of a simple shunting engine, e.g. a locotractor. »

We mention the rail motor vehicle as a useful means of concentrating traffic towards the centre-station or for distribution by the secondary stations. The case quoted by Mr. Savary comes within this general wording.

Are there any other observations?

Mr. van Rijckevorsel, Netherlands Railways (in French). — For the last four years, we have organised in Holland a system identical to that mentioned by Mr. Savary. The results are excellent. We suffer a lot from competition by road motor companies. Latterly, the effects of this competition have been greatly decreased, thanks to the new services which we have organised. We cannot say that this competition has been entirely put an end to, but at any rate it is much weaker. We have a company called the « A. T. O. » which is not obliged to have fixed rates like the railway; in certain cases it can lower its rates to compete with the motor services. This « A. T. O. » Company can also make contracts with other companies so as to serve an extensive area, based on a centre-station.

The « A. T. O. » Company also makes contracts with shipping companies. In this way the parcels can be loaded from the road motors on to boats which can go to places not accessible to the railway.

It is not my intention to make any observations, but I would like you to know that we already have such a service in operation and that we are very satisfied with the results. The shares of the « A. T. O. » are all held by the Netherland Railways, and the heads of departments and general managers are the directors of the said company. In this way, the railway has full control over this company.

The President (in French). — These remarks are very interesting; they will be reported in the minutes of the Meeting.

Mr. van Rijckevorsel. — Thank you, Mr. President.

The President (in French). — We can now return to our final summaries. If you think there are no further remarks to be made, we can definitely adopt these summaries, in the form that has just been read to you.

— No other remarks are made, and the text of the summaries is adopted.

— The Meeting ends at 11.15 a.m.

DISCUSSION AT THE PLENARY MEETING.

held on the 24 January 1933 (morning).

H. E. Ibrahim FAHMY KERIM Pasha in the Chair.
General Secretaries : Messrs. P. GHILAIN, Youssef RISGALLAH Bey, Dr. I. G. LEVI and FOUAD HASSIB Bey.
Assistant General Secretaries : Sir Henry FOWLER and Mr. P. WOLF.

Mr. Ghislain, *General Secretary*. — We now come to the summaries of Question VIII, which have been published in yesterday's issue of the *Daily Journal of the Session*.

— *These summaries are read out.*

The President. — Are there any objections as regards the text of these summaries.

— *No comments.*

We shall consequently consider these summaries as ratified.

Summaries.

« The reports presented to the Congress on the subject of the organisation of parcels transport bring to light the efforts made by the Railway Companies towards a better service of ordinary and fast goods transport with the object of improvements called for by the necessity for retaining this traffic, which is being strongly disputed by automobile competition.

« Many points arise out of the various measures taken or suggestions put forward in respect of rail transport, and complementary transport from the premises of the sender to the despatching station and from the arrival station to the consignee's premises.

« First of all, for the rapid transport of parcels by rail must be borne in mind the solution by the employment of light trains, inaugurated on the Deutsche Reichsbahn under the title of *Leichte Stückgüterzüge* and known on the Italian State Railways as *Treni rapidi collettame*.

« Alternately, it may be advantageous to substitute for the multitude of despatching and receiving stations a limited number of centre-stations, commanding operating zones of some extent and constituting principal points of departure and arrival for rail borne parcels traffic, the connections between the centre-stations being maintained by rail.

« The object is to group the elements for making up full wagons or groups, the transport of which must be effected rapidly. The concentration of packages at the centre-station or the distribution at the secondary stations may be carried out either by road lorries or by rail cars designed in such a way as to provide economical transport, or even by means of a simple shunting engine, e. g. a loco-tractor.

« In regard to complementary transport, it is essential that the railway endeavours to realise, as far as lies in its power, the convenience that the automobile service offers to the public, especially door-to-door transport.

« The use of containers for groups of « packages, which cannot fully load a « wagon, has constituted an improve- « ment; this should be followed up and « extended, especially in international « traffic.

« For single packages, the system « should be developed of collection at « private houses and at receiving offices, « the number of which should be in- « creased in the big towns. This pro- « gramme may be carried out either « by Express Companies making use of « the railway or by the Railways them- « selves, by means of lorries equipped in « an up-to-date manner, in order to meet « the demand for greatest rapidity both « in transport to the station and delivery « on arrival.

« In this respect it is useful to unify, « on any one System, the scale of cartage « charges, with a view to facilitating the « task of the public, always worried by « the complication of documents.

« With the same object in view, it may « be advantageous to look for new for- « mulæ for rate making, based on the « practice of the automobile services. « For example, when hiring to Express « Companies, Factories, or Merchants, « wagons to be transported, whether full « or empty, on a kilometric basis, the « senders would come to prefer the use « of wagon and rail transport to trans- « port by lorry. The Express Company « would have a representative in charge « of the distribution of the packages to « the consignees, and would, moreover, « be induced to canvass for return « freight.

« To sum up, every means should be « employed to enable the railway to ren- « der the services that the automobile « offers to the public, not only by mo- « dernising its methods but also by en- « couraging its employees to influence « the public in such a manner as to re- « tain and secure traffic and to direct « the minds towards a more exact com- « prehension of the general economy. »

QUESTION IX :

Automatic train control and train stop. Track equipment. Locomotive fittings. Methods used for repeating signals on the locomotives. Devices intended to ensure the attention of the drivers.

Preliminary documents.

1st report (All countries except America, Great Britain, Dominions and Colonies, China, Japan, Belgium, Spain, France, Italy, Netherlands, Portugal and their Colonies, Denmark, Finland, Luxemburg, Norway and Sweden), by Mr. W. Stäckel. (See *Bulletin*, May 1932, p. 811, or separate issue No. 11.)

2nd report (America, Great Britain, Dominions and Colonies, China and Japan), by Mr. G. H. Crook. (See *Bulletin*, May 1932, p. 705, or separate issue No. 8.)

3rd report (Belgium, Spain, France, Italy, Netherlands, Portugal and their Colonies, Denmark, Finland, Luxemburg, Norway, Sweden and Switzerland), by Mr. V. Vlaikoff. (See *Bulletin*, October 1932, p. 2023, or separate issue No. 33.)

Special Reporter : Mr. W. Stäckel. (See *Bulletin*, January 1933, p. 118.)

DISCUSSION BY THE SECTION.

Meeting held on the 23 January 1933.

Mr. M. MARGOT, President of the 3rd Section, in the Chair.

— The Meeting is opened at 9.30 a. m.

The President (in French). — Gentlemen, we have to examine Question IX today. This question was made the subject of three reports which Mr. Stäckel has summed up in his Special Report.

I will begin by asking Mr. Stäckel to give us a short review of his report.

Mr. Stäckel, *Special Reporter* (in German). — I would like to make a few preliminary remarks. Certain linguistic difficulties have arisen and there have been some mistakes in translating the technical terms describing the devices with which we shall have to deal during this meeting. I refer to the automatic application of the brake and also to the transmission of signals to the locomotive. In shorter terms, these devices are known in Germany under the names of « forced braking » and « cab signal ». Technically the two devices differ but little and are

based on the same principles. As, for example on the English railw ys, « forced braking » or as it is known in England « automatic brake application » is combined with the « cab signal », we have introduced in the German language a common expression for the two, the built-up word « Zugbeeinflussung ». By this we understand an automatic action set up from the railway track and acting on the train in motion, which is used to guarantee the safety of the service. We must not include, therefore, under this heading, such cases as, for example, on electrified railways, the picking up of current from the overhead wire, since this does not in any way guarantee safety of working. The same remark applies to the fixed signal which, while it is used to protect the train, does not transmit automatically its action to the train. These explanations will be sufficient, I think, to enable you to understand what we mean by « Zugbeeinflussung ».

Mr. Stäckel then reads in German the summaries of his report, the English text of which is as follows :

1. The *desirability* of equipping a railway system or individual lines with train control apparatus depends amongst other things upon the train speed, the intensity of the traffic, the interval between signals and the cost of installation.

2. In developing automatic train control it has to be considered as an adjunct to the existing signalling equipment. It is intended to ensure the observance of signal indications whenever the driver fails to take notice of them, or to avoid the consequences that might result from such failures. But in the main, safe running has to be guaranteed primarily by the alertness of the driver. It follows, therefore, that generally speaking the installation of automatic train control should *not* be accompanied by removal of the fixed signals.

3. The continuous inductive system of automatic control is capable of meeting operating and safety requirements to a somewhat greater extent than the intermittent inductive system. Sufficient information is not yet available to form the basis of a decision as to whether this advantage is or not outweighed by the higher cost and greater delicacy of the continuous system. The most important operating and safety conditions can be met by the intermittent system. The continuous system should be considered chiefly in connection with lines equipped with automatic signalling.

4. The *purely mechanical* method of transmission has proved a reliable method of conveying intermittent impulses from the track to the locomotive on metropolitan systems. Where snow or other deposits on the track are liable to cause disturbances, it is desirable to arrange the transmitting apparatus at a suitable height above rail level. Difference of opinion exists as to the suitability of the purely mechanical system of transmission for fast train routes.

5. The *electromechanical system of transmission* using contact ramps has given satisfactory results in countries having temperate climates (Western Europe); in some cases, however, protection has to be provided against hoar frost. An essential condition for the employment of the electromechanical design is the existence of ample clearance between the underside of the vehicle and the track.

6. Various *electro-inductive* systems have proved reliable and not sensitive to climatic conditions on fast train routes.

7. With the *continuous inductive automatic control,* only inductive transmission by the track circuits can be considered at present.

8. An advantage of the electromechanical and the inductive types of equipment as compared with other designs is that they *do not require any operating gear in the track.* In certain types of inductive equipment it

has been possible to dispense with a local supply of current.

9. The application of the *closed-circuit principle*, in such a way that faults cause a control impulse to be given, has the advantage that the staff is more interested in the correct maintenance of the equipment, but this arrangement can lead to certain drawbacks in operation. The question as to whether the closed-circuit principle is to be applied depends on the general arrangement and the method of operation of the automatic train control system.

10. The *main purpose* of automatic train control is to absolutely ensure that the train shall stop in front of a home signal that is *at danger*. It is desirable to design the equipment so that safeguards can be applied to ensure *reductions of speed* at junctions and other places where such restrictions are stipulated. Systems which give several kinds of impulses are especially suitable for this requirement.

11. It is desirable that the system of operating automatic train control should be such that the *attention* of the driver is affected as little as possible by his being conscious of the existence of the automatic control apparatus.

12. In the case of railway services in which short braking distances are the rule, the consequences of the driver failing to comply with the signals can be fully averted by an automatic control transmitter *at* the home signal, provided that the impulse causes the brakes to be applied immediately, and that the distance between the home signal and the danger point is at least equal to the full braking distance.

As a rule these conditions are not fulfilled on fast train routes; first of all, an automatic control action *in advance* of the home signal is therefore essential in such cases.

13. With systems which come into operation *in advance* of the home signal, or at the distant signal, the arrangements can be simplified by dispensing with the brake application. Cab signals without compulsory braking, when used in conjunction with a vigilance checking device and recording apparatus, assure a notable increase in safety as compared with the conditions if no automatic train control were employed.

14. In order to prevent the possibility of improper driving beyond the advance signal, *in spite of a caution indication having been received*, it is desirable that *application of the brakes* shall also occur with automatic control transmitters *in advance* of the home signal. Only when danger exists, however, should braking be continued up to the point of complete stoppage; contrariwise, when the driver is running according to regulations, control of the speed should remain in his hands.

15. For drawing attention to the possibility of danger, either a vigilance checking device, or an arrangement for graded speed checks are available. The *vigilance* check in the vicinity of the distant signal can be supplemented by a speed check that comes into operation later.

16. The *vigilance checking device* must enable the driver to prevent the brakes coming into operation in the neighbourhood of a distant signal. It may be an advantage, from the point of view of maintaining smooth operation, if in addition, it is possible to release the brakes subsequently.

However, the alertness of the driver is better guaranteed if braking continues to the point of standstill, after he has failed to apply the vigilance checking device, and release of the brakes can only be effected when the train has stopped.

17. The desirability of making the automatic control impulses perceptible, by means of *visual* or *audible* signals, in systems which include application of the brakes, depends in turn upon the relative importance that is attached to maintaining the flow of traffic or to enforcing alertness.

18. With a view to maintaining proper supervision over the use of the vigilance

checking device and the existence of the control impulses, it is recommended that *recording apparatus* should be fitted which should if possible record the speed and indicate the location at which each event has occurred.

19. It is not yet clear whether automatic train control systems are satisfactory which do not use a vigilance check and rely solely on *graded speed restriction control.*

20. Designs which embody unconditional braking at a danger signal require a cancelling-out device so that in the event of *signal failures* it may be possible to run past a signal which is at danger.

21. It must be possible for the driver to cut out the automatic control apparatus in the event of faults occurring in the equipment on the engine.

22. Automatic train control is an important complement to the safety precautions. Its introduction is recommended on routes where it appears necessary in the light of the considerations of paragraph 1, as far as permitted by economic conditions and other requirements.

The President. — I am sure that I interpret the feelings of the Meeting in thanking the Special Reporter for his very excellent report. *(Applause.)*

We will now proceed to discuss the question generally. It is understood that the final summaries which the meeting will be called upon to agree will be drafted so as to take account of the observations put forward during the discussions. *(General agreement.)*

Lieut. Colonel Mount, Ministry of Transport, Great Britain. — Mr. President and Gentlemen, I am glad to have this opportunity of complimenting the Writers on their very interesting reports, and also the Special Reporter on his able summary. I think the whole of the ground has been fully covered; I am generally in accord with the summary, and have little to add. I should like to say that I am not representing Mr. Crook of the Great Western Railway, who is unable to attend, but I represent the Ministry of Transport. I was a member of a Committee which reported to the Minister on this subject in 1930, when recommendations were made to adopt a system of automatic train control (this Committee was known as the Automatic Train Control Committee) like that on the Great Western Railway, and to experiment further with the Strowger-Hudd inductive system. The report is of some interest as it introduces the terms « direct » and « indirect » with regard to safety measures generally. The former (direct measures) includes automatic train control and such safeguards as traps, derailers, sand drags, detonator placing equipment, etc.; while the latter (indirect measures) was divided into the following categories: *a*) visibility from the cab, and the positioning of signals; *b*) powerful signal lights; and *c*) signal lever interlocking with relation to block transmission.

The Committee expressed a preference for « direct » methods of increasing security and it is of interest to remark that while the Great Western Railway has now equipped some 2 500 engines and 2 200 track-miles at a cost of about £ 190 000, progress is also being made in various large installations with the « indirect » method by substituting colour-light signals for semaphores. I mention this because, on page 118, of the Special Report (*Bulletin*, January 1933), it is said that « other countries which have little or no experience of accidents due to overrunning of signals naturally view automatic train control with little interest ». On the contrary, in spite of their wonderful record of immunity from serious accident, British Railways are alive to,

and spend large sums upon, still further improving security in various ways. They look on it as a matter of insurance. For instance, the last fatality in a passenger train accident on the Great Western Railway occurred, I think, in 1928, when a workman was killed in a colliers train collision, while that followed a period of no less than 15 or 16 years of immunity from a fatal accident to a passenger. I would add that only the Southern Railway are mentioned as experimenting with the Strowger-Hudd system, but the London Midland and Scottish are also experimenting with the system.

I am very glad to see the opinion with regard to retention of signals, as I should certainly oppose widespread removal for various reasons, at any rate on main lines operating at high speed.

With regard to the remarks about frost and ice affecting some designs, I presume that the « crocodile » is mainly referred to. I have not heard of any complaints in this respect relative to the Great Western Railway's ramps; nor should I expect it, having regard to the heavy and substantial nature of their equipment, making such definite contact.

I would draw attention to the fact that the Great Western Railway use the « closed circuit » system, whereas I gather that the French crocodile equipment depends upon picking up current from a ramp for producing the « warning » effect, which of course is exactly what the Great Western system avoids.

The last point I would like to mention is that the special report, on page 128, refers to misuse of Automatic Train Control apparatus, and the necessity, in consequence, for recording apparatus. On the Great Western Railway, drivers would, in my opinion, in no circumstances misuse the equipment, as they are only too appreciative of the advantages of its existence.

The President (in French). — Colonel Mount has just given us much information on the work done in England; he is in fact in favour of automatic train control, which shows, I think, that there is a question of principle to be cleared up : must we introduce automatic train control or not, seeing that, as the Special Reporter pointed out, there are two quite distinct questions :

1. the repetition of the fixed signals on the locomotive;

2. the automatic control of the trains?

I think, therefore, that it is in our interest to examine the question of principle before we discuss any question of system or arrangement.

Has anyone anything to say on the question of the principle of automatic train control?

Mr. Duchatel, French Est Railways (in French). — Gentlemen, in my opinion, there is a very clear distinction, in principle, between the simple repetition of the signals and the automatic control of the trains.

If we consider how a driver should act at the moment he passes a signal not in the off position, we see that there are three things he ought to do :

1. he should understand quite clearly the indication the signal gives him;

2. he should translate this indication, correctly understood, by thinking out what action he should take on the locomotive;

3. he should carry out this action.

We have, as it were, a play in three acts in a very short time, and if this play

in three acts ends sometimes, too frequently alas!, in drama, it is because in most cases, if not in all, the first act has been a failure.

The important thing in sighting signals is to perceive the indication given by the signal. Once this indication has been well absorbed, the stop — when a stop is required — is very rarely made badly.

To meet the risk of the signals not being perceived, — a risk which unfortunately is a real one — in particular in the case of express trains in bad weather — audible repetition of the signals on the engine is advocated, and in France this audible repetition has been successfully carried out, because we have been careful not to weaken the vigilance of the driver by recording his alertness and keeping a very close supervision thereon.

Is it necessary not only to repeat the signal, but also to substitute automatic action for that of the driver in stopping the train? This is a second question which arises after the first, but which is quite distinct from it.

Actually it is a question of covering a different risk, that presented by a driver who, having correctly read the indication given him by a signal, does not do exactly what he should after having read the signal indication.

I have already said that this risk was of very little importance. I would go so far as to say that there is almost no risk when the signals have been audibly repeated on the locomotive and the driver has with him a fireman who also hears the warning of a signal overrun in the « on » position, and who can even act for the driver if the latter should fail by any chance, a very remote likelihood.

My conclusion, therefore, is that, in principle, the automatic control of the brake does not provide any appreciable additional safety so as to justify the expenditure involved, in all cases in which the signals are also audibly repeated on the locomotive, and when the driver has a fireman with him, or in those cases when the driver is alone, in which arrangements are made for the headguard to make good any failure of the driver.

I will go still further; I consider that automatic control of the brake on the locomotive, — quite separate, I insist, from the repetition of the signals, — can only be really effective — supposing it is useful — in quite exceptional cases in which, on the one hand, the spacing of the trains is such that there are always two home signals between two trains and, on the other hand, the distance between two succeeding home signals is not less than the stopping distance of the train for which this distance is greatest.

If these two conditions do in fact occur, it will be appreciated that all that is needed is to arrange for the brakes to be applied automatically the moment the train passes the first home signal at danger that it meets : the train will stop before the second home signal, and consequently before it could overtake the preceding train, and the apparatus will only function — the Special Reporter has shown this quite clearly — in cases in which the driver has really made a mistake.

If, on the contrary, the two conditions I have just mentioned are not fulfilled, that is to say if there are not two succeeding home signals between two trains following one another, or if the stopping distance between two succeeding signals is not great enough to ensure all trains being brought to a stop, track equipment for automatically applying the brake on the locomotives must be provided before the home signal is reached.

Another difficulty then arises. If on the lines — these are the most numerous

I believe — on which the trains following one another either are running at different speeds, or have different brake power and consequently require widely varying distances in which to stop, we wish to stop automatically all the trains before the home signal is reached, the automatic control must act at a sufficient distance so that the train requiring the longest distance in which to stop will stop at the home signal : but then those trains on which the brakes could have been applied later will stop too soon, and this will upset the working seriously with possibilities of greater danger than the risk we want to suppress.

If, on the contrary, to avoid interference with the working, the automatic control, or the track equipment operating it, is installed near the home signal, so that no train will stop too soon, the automatic control has no longer any, or at the best very little, efficacy; it will no longer prevent the home signal being overrun, but will only reduce the distance by which it is overrun, and under such conditions it may be questioned if the result is proportionate to the expenditure involved.

To sum up, I think that under normal railway operating conditions — which interest us directly — that is to say under the conditions in which trains are required to work over the same line at different speeds and under different braking conditions, repetition of the signals on the engine is of great utility, and the automatic control useless.

I should be glad if these principles were reproduced in the summaries to be submitted to the General Meeting.

The President. — Has Mr. Stäckel anything to add?

Mr. Stäckel (in German). — I think the thesis put forward by Mr. Duchatel, that we could be satisfied with cab signals, deserves our consideration. On the other hand, it must be realised that there are cases in which a physical failure of the driver might have serious consequences. Such cases have been considered sufficiently important by most railway administrations for them to consider it desirable to agree to the very small additional expenditure involved in installing *automatic* control. Mr. Duchatel's theories do not appear to be proved in practical instances of automatic braking. No administration has introduced automatic braking which comes into action at the distant signal. There are, moreover, no installations where the brake is applied too late. This only occurs if the driver neglects to operate the vigilance checking device, or if he continues to run at a dangerous speed. This is the reason why many railways have been led either to provide automatic braking only in case of danger, or to combine automatic braking with audible signals. I do not think that we can decide in principle not to use automatic braking.

The President (in French). — Does anyone else wish to speak?

Mr. Gresley, London & North Eastern Railway, England. — With regard to the point raised by Mr. Duchatel on the question of additional cost which would be incurred by making the application of the brakes when the train passes the warning signal, I should like to call attention to the system adopted on the Great Western Railway in England. There would be no additional cost, because the audible indication to the driver is given by the release of air from the brake appliances.

On the question of safety, we, in Eng-

land, think it very desirable that when the driver passes the distant signal in the warning position, there should be a partial application of the brakes, because if, as Mr. Stäckel says, anything were wrong with the driver, for instance if he were suddenly taken ill, the safety of the train is looked after automatically and the train would be brought to a standstill before reaching the home signal. There does not appear to be any difficulty due to this application of the brakes. The Great Western Railway system has been in existence for several years and we cannot see that the system can in any way produce conditions which are a danger to traffic. Even if fully equipped with vacuum brake or continuous brake, or if only partially fitted with it, the train would be brought to a standstill before the home signal is reached; it might go so far as even to overrun the home signal, but speed would have been so much reduced during the running from the distant to the home signal that this would be all to the good in reducing the consequences of any mistake in obeying signals.

The President. — Does anyone else wish to speak?

Mr. Savary, Swiss Federal Railways (in French). — Mr. Duchatel's conclusions tend to oppose audible repetition of the signals to automatic application of the brakes. With Mr. Duchatel I would like to stress the word « audible », because there is absolute interest in having an audible warning whether it be steam or electric traction, because of the many incidents which may arise unexpectedly and distract the attention of the enginemen from observing the signals.

It is almost a retrograde step from the present position of safety on electrified lines, in Switzerland for example, to put the two systems into opposition with one another.

On our electrified lines we have only one man on the footplate, and this is the system of the future, whatever the staff may say for interested reasons.

In the case of one-man driving, we use the arrangement known as the « dead man's handle », which implies the control of the physical condition of the driver, an arrangement which can easily be combined with automatic braking.

It is in fact relatively simple, by using an inductive device, to couple this circuit with the signal circuit, these two safety devices making it possible for the track signal to control the braking action and to operate the audible cab signal.

The question of the distance between the signals, raised by Mr. Duchatel, will be completely changed when daylight signals are introduced, because the important distances are not only those between the distant and home signals, but also those between the home signals and the first dangerous point encountered in the stations.

As regards the alertness of the driver, everyone agrees that the safety of the trains ought not to depend alone on the vagaries of an electric current or on the elasticity of a spring, but on the watchfulness of the driver.

Now, this can be checked by enabling the driver to take action between the warning of a signal at danger and the application of the brakes. If the driver allows the brakes to be applied, it shows that he has not been attentive to his signals; in this way his alertness is checked, and in the case in question he will be required to give an explanation. We have therefore a permanent factor of safety.

As regards the cost of installation, our

experience in Switzerland, with one-man driving, is that the additional costs are considerably greater. The cost of a set of track inductive equipment we estimate to be 5 000 to 6 000 gold francs; however, this expenditure is quickly economised by saving one man on the footplate of the electric locomotive.

Now, of the two systems — the automatic which checks the alertness of the driver, or the presence of a second man on the electric locomotive — who has nothing to do — I much prefer the first.

This is the reason why I say Mr. Duchatel's conclusions appear to me rather too narrow.

The President. — We have before us two very definite opinions. Would Mr. Duchatel like to reply?

Mr. Duchatel. — The remarks made by Mr. Savary — to which I would reply at once — show that I did not expound the problem sufficiently when I first spoke.

Actually, I have considered more especially the case of steam lines on which there are two men on the locomotive, or on which, when one man is absent, when there is no longer a fireman, arrangements are made for the guard to take the necessary action in the event of anything untoward happening to the driver.

In addition, there is the case of the electrified lines on some of which there is only one man on the engine with an automatic stopping device generally known as the « dead man's handle ». I willingly admit that in the case of the Swiss Railways — which is quite a special one — if the locomotives are already fitted with the dead man's handle and if it is possible at low cost — I am somewhat sceptical about the figures I have just heard — to complete this arrangement by automatic brake control which will stop the train if the signal is overrun — it may be of value to introduce automatic train control seeing that as the trains generally run at much the same speeds, the conditions of application of automatic control are not very likely to hinder the driver's action.

We have before us a very special case, and probably had I to solve it, my conclusions would be the same as those of Mr. Savary.

The case on our lines is entirely different : we have trains running at speeds of 120 km. (75 miles) and others at 30 km. (18.6 miles) an hour.

In a case of this sort, I think that there are difficulties in installing automatic train control which will reduce its efficiency to such an extent that we may assume that, to use a trivial expression, it is not worth one's while.

I would now like to reply to Mr. Gresley and to Mr. Stäckel as to the actual efficacy of the system.

The object of installing audible cab signals is to do away or reduce as far as possible an actual, great, and serious risk, that of non-perception of signal indications.

I believe it is an indisputable fact, and one which probably occurs in the same way on all railways, that some signals are either not noticed or are badly sighted by the driver. When this occurs, the consequences can be very unfortunate. Most serious accidents are due to this cause.

When the signal has been correctly observed, it is extremely rare for the driver not to comply with its indication in a proper manner.

Now, the automatic control of the brake equipment on the locomotive superimposed on audible cab signals can only effectively operate to minimise this second and very slight risk.

In our case, were we to wish to add this automatic control of the train brakes to the signal repetition already fitted, the cost would be very heavy. Our equipment would have to be modified completely and the further expenditure would be much the same as that we have already incurred.

With what object? To cover an almost non-existent danger! This is why I have come to the conclusion that on our railways automatic train control is not of any value.

In addition, I would like to add, stressing the point once again, that not only is automatic train control not of interest because the risk is small, but that it is impracticable as if installed so as to overcome the danger in question, other drawbacks would result.

Once again I would like to insist on the above point, because there are, I think, but two ways of working : either to stop all trains before the home signals, those running at 120 km. an hour and those running at 30 km., which involves stopping the slowest and best braked prematurely, or not to stop any train too soon, which would involve allowing the fastest and worst braked trains to run past the home signals. In both cases the result would be unsatisfactory.

The President (in French). — Mr. Stäckel will now speak, as he wishes to reply briefly to Mr. Duchatel.

Mr. Stäckel (in German). — In reply to Mr. Duchatel's remarks, I would like to say something more about the German equipment. We do not wish to give the driver audible signals because we are afraid that it might make him less alert. I know that this is done in France because the action taken by the driver is closely checked by means of recording devices. In Germany we have not introduced any such close check as it means a considerable expenditure and because we felt it unnecessary to remind the driver of his duty. We arranged our train control (Zugbeeinflussung) in such a way that it only acted at the end of a certain time interval after the train passed the distant signal, and then only if the driver was not paying attention, that is to say had not made use of the vigilance control device. Now as, as a result of his failure, the driver has already lost part of the allowed braking distance, we felt we could not be satisfied by an audible signal but must cause the brake to be applied, because we could lose no more time in stopping the train. This is how we were led to adopt automatic braking.

Mr. Chalk, North Western Railway (India). — In India, we have three men on the footplate, the driver, the fireman and a coal breaker and general assistant, and we hold the driver entirely responsible for signals. The other men assist him, but are not in any way responsible for anything resulting from the overrunning of signals.

Mr. Vallantin, Paris, Lyons & Mediterranean Railway (in French). — From Mr. Gresley's remarks I think I understand that the Great Western Railway is the only one of the English railways using automatic train control. Do the three other group railways intend to adopt the Great Western system, or are they content to retain their present safety devices?

The President. — Can anyone answer Mr. Vallantin's question?

Mr. Gresley. — In reply to Mr. Vallantin's question, I would like to mention that the only Railway in England that

has automatic train control in extensive use is the Great Western Railway; on the London and North Eastern Railway a section of line is equipped with another form of automatic train control. Colonel Mount has mentioned that the London Midland and Scottish and the Southern Railways are at the present time engaged in making experiments with the Hudd system.

The President (in French). — To sum up, the result of a very interesting discussion is that we have before us opinion which, I do not say are contradictory, but which are not unanimous.

Seeing that we are dealing with a question of safety and consequently with a delicate matter, I think we ought to take our time in drawing up summaries which, whilst not too vague, will allow each of us to retain or modify his view of the matter according to circumstances and the tests which would be carried out.

We have, on the one hand, the very clear thesis of the Special Reporter speaking in the name of the German National Railways, which went straight over to automatic train control without audible cab signals and without any very close check on the driver's vigilance.

On the other hand, we have the directly opposite opinion, that of Mr. Duchatel, who considers that the audible cab signal is the first thing to be provided. He has shown that he looks upon automatic braking as an addition, the effectiveness of which he questions, and he has shown that the installation of such equipment requires very careful consideration on account of the expenditure involved. His opinion is that this automatic braking is not able to add appreciably to safety.

There is then the English method which consists of audible signals completed by automatic control. Owing to the repeating system used — if I have properly understood it — this automatic control can be added without appreciable expenditure and readily. Mr. Gresley has said that during a long experience of this method no drawbacks have resulted.

We have before us Mr. Savary's statement, which Mr. Duchatel recognises to be a particular case, and one which has given every satisfaction.

We said at the start that the summaries of the Special Reporter were only a resumé, though a very complete one, and that the summaries should result from the discussions.

I suggest therefore to the Meeting that the Bureau of the Section should draft the final summaries based on the different opinions expressed.

If everybody agrees, as a little time is required to draft the summaries, we might meet after the full Meeting in order to deal with the text put before us.

We could continue the discussion if need be or at least agree our attitude and so end with summaries satisfactory to everybody.

As there appears to be no objections to this proposal, I conclude we are all in agreement.

— The Meeting then terminated.

Meeting held on the 23 January 1933.

Mr. MARGOT, President of the 3rd Section, in the Chair.

— The Meeting is opened at 11.30.

The President (in French). — Gentlemen, we have to resume the discussion of Question IX, which is common to Sections II and III. After the interesting discussions we had yesterday, the Bureau of the Section was asked to draw up draft summaries limited to the enunciation of the principles brought out during the discussions. The draft prepared has been drawn up in full agreement with the Special Reporter whose knowledge of the subject you were able to appreciate yesterday, and who was good enough to assist us with his collaboration. This text has been translated into three languages, and was distributed to you this morning.

Naturally, we have been careful to take into account the remarks made. While certain points were admitted readily enough yesterday, the difficult question on which the controversy bore was the advantages of automatic control. The advantages of this system, put forward by some of you were contested by others; still others preferred automatic repetition of the signals. In our draft, we have endeavoured to bring out the advantages of automatic control, and we have considered that the audible cab signals might be used; finally the draft only attributes a certain additional safety to automatic train control.

We will now read the draft :

Transmission of signals on to the locomotive constitutes an important additional measure of safety. The installation is recommended when this additional safety precaution (consideration being given to the speed of the trains, intensity of the traffic and frequency of the signals) justifies the cost of the installation.

This transmission can be utilised for a simple acoustic or visual repetition of signals, leaving it to the driver to take the necessary action to stop or slow up, or for automatic control, immediate or deferred, of the brake apparatus of the locomotive.

This is the first part of the draft and ought not to raise any objections, because in reality it is a general review.

(The English and German translations of this draft are then read.)

The President. — Has anyone any remarks to make?

Lieut. Colonel Mount. — As I said yesterday, Mr. President, I am in general accord with the summary of the Special Reporter. It meets our views generally except perhaps in respect to Clause 9. I therefore do not think that these two paragraphs are any improvement on paragraphs 1 and 2 of the original summary, which I should prefer.

The President (in French). — The change of text was made by the Bureau in order to meet the wishes expressed during the meeting. It was necessary to point out that there was, on the one hand, the question of repetition of the signals, and on the other the question of train control. This is the object of this wording; it endeavours to bring out that there are different ideas on this subject, which can be complementary, which are equally important, and which can be applied separately. Audible signals can be

provided without automatic train control, just as automatic train control can be installed without audible signals or alternatively both can be provided simultaneously.

We, like the Special Reporter, think that the first two paragraphs of the original summaries do not bring out with sufficient clearness these two ideas, whereas we consider that our new wording does so.

You will find passages completing the second paragraph under numbers 3 and 4. The first is borrowed from summaries numbers 1 and 2 of the Special Reporter.

Our draft continues as follows :

In any case, the maintenance of safety must, as in the past, depend on the vigilance of the driver, and it is necessary that care be taken so that this vigilance does not run the risk of becoming blunted.

For this same reason it is generally advisable not to remove the fixed signals from the permanent way.

These paragraphs form a whole, reproducing points numbers 1 and 2 of the text of the Special Reporter, adding to them the gist of yesterday's discussions.

On the lines that have not yet equipped for the acoustic repetition of signals, the automatic brake control of the locomotive may give a certain additional measure of safety, if it does not otherwise produce, from the point of view of the traffic, difficulties capable of causing risks to arise, at least as great as those which it is proposed to suppress.

It would be well, on the other hand, that the expense incurred for this purpose should not be out of proportion to the result likely to be obtained.

Continuous connection between the road and the locomotive seems, in principle, to be preferable to intermittent connection. However, intermittent connection, alone, gives sufficient safety, so that recourse to continuous connection should not be resorted to if complications or additional expenses of any magnitude are likely to arise.

Mr. Gresley suggests the following addition : « The application of the *closed-circuit* principle, in such a way that it operates as a warning, is provided as a measure of safety. »

Briefly this restores, but in simpler terms, part of the summaries given in the special report under 9 as follows :

The application of the *closed-circuit principle*, in such a way that faults cause a control impulse to be given, has the advantage that the staff is more interested in the correct maintenance of the equipment, but this arrangement can lead to certain drawbacks in operation. The question as to whether the closed-circuit principle is to be applied depends on the general arrangement and the method of operation of the automatic train control system.

Mr. Gresley's wording is more simple, and deserves to be examined carefully.

(The remaining new summaries suggested by the Bureau of the Section are translated into English and German.)

The President (in French). — I imagine everyone has in his possession the proposed text as well as the further draft suggested by Mr. Gresley.

I suggest that we follow this text, which must be taken as a whole, except for any alterations or additions you consider desirable.

Mr. Gresley. — Mr. President, at the discussion which took place yesterday, the principal point of contention, as mentioned just now, was as to whether the audible indication to the driver should be considered apart from brake application. As to this we say it is necessary to

have partial brake application, but on which there is divergence of opinion. We, on the English side, who are interested in train control, are quite prepared to accept the summary which was put forward, subject to the modification which has been proposed to Clause 9; it shortens it and in our opinion is an improvement. I did not submit that as a supplement to this amendment. I think that the summary, as now put forward, is not, with due respect to those who drew it up, as indicative of the opinions of the Congress as the summary which was originally submitted to us. This new summary has been prepared without consultation with the English representatives, and there are certain points with which we cannot possibly agree.

With regard to paragraph 5 : — « On the lines that have not yet equipped for the acoustic repetition of signals, the automatic brake control of the locomotive may give a certain additional measure of safety, if it does not otherwise produce, from the point of view of the traffic, difficulties capable of causing risks to arise, at least as great as those which it is proposed to suppress » — the whole of the experience in England, during the 15 or 20 years that the Great Western Railway have had it in operation, shows that it is desirable to have this brake application, and it is suggested that the advantages of train control might be seriously impaired if no partial brake application were made. This we cannot agree to, as being contrary to our experience for many years on large installations.

I now come back to article 1 of the old summaries which reads :

The *desirability* of equipping a railway system or individual lines with train control apparatus depends amongst other things upon the train speed, the intensity of the traffic, the interval between signals and the cost of installation.

My feeling is that too much stress is laid on the question of first cost, in the new summary which is worded as follows: « The installation is recommended when this additional safety precaution (consideration being given to the speed of the trains, intensity of the traffic and frequency of the signals) justifies the cost of the installation. »

Too much importance is given therein to the cost of installation and not enough to the other factors.

I am also of the opinion that the 2nd paragraph of the old wording better expresses the main idea which has to be conveyed : « But in the main, safe running has to be guaranteed primarily by the alertness of the diver. »

I do not mean that this idea is not well expressed in the new text, but that it is more categorical in the old wording.

I would submit, therefore, that instead of adopting this amended summary, we should stick to the summary by the Special Reporter, subject to the amendment of Clause 9.

Mr. Tevfik Fazli, Turkish State Railways (in German). — So far, we have no automatic train control in Turkey. The advantages and drawbacks of two systems have been expounded here yesterday, and I expected to be able to find out which of these systems could be recommended for a railway on which such devices were not yet in use. Unhappily no formal opinion is expressed in the summaries.

Mr. Avery, North Western Railway, India. — I would like to suggest an amendment, which is that the automatic train

stop and audible signals should only be applied in case the lock and block system or any similar system of working fails. The reason why I mention this is that, in ordinary cases of « line clear », the human element comes into play a great deal, and it is quite possible for a train to be standing at the home signal and for the signalman to forget that it is there, whereas with the lock and block system, the instrument cannot be operated until such time as the train has passed the home signal. In the case of « line clear », if a train happens to be standing on that section of the line which has been allowed — for safety — for overrunning, the automatic brake will not stop that train in sufficient time. In such cases, I consider that that portion of the line should be track-circuited, so that the automatic stop comes into play long before reaching the distant signal, that is to say two automatic train stops would be used, or the audible signal would come into play on two separate occasions.

The President. — Has anyone any further remarks to make?

Lieut. Colonel Mount. — May I be permitted to say that the position between the two main points of view is well defined in paragraph 13, where it is said that :

With systems which come into operation *in advance* of the home signal, or at the distant signal, the arrangements can be simplified by dispensing with the brake application. Cab signals without compulsory braking, when used in conjunction with a vigilance checking device and recording apparatus, assure a notable increase in safety as compared with the conditions if no automatic train control were employed.

I therefore second Mr. Gresley's proposal that the original printed text be acepted with the minor addition of the amendment to paragraph 9.

The President (in French). — We have therefore before us a proposal to restore the original wording amended in certain details and to drop the new wording proposed by the Bureau of the Section.

Mr. Bals, Rumanian Railways (in French). — I think the text put forward by the Special Reporter can be retained provided the wording of paragraph 2 be slightly altered in the following sense.

The passage : « In developing automatic train control, it has to be considered as an adjunct to the existing signalling equipment » could remain. But in my opinion the following one should be modified; it says : « It is intended to ensure the observance of signal indications whenever the driver fails to take notice of them, or to avoid the consequences that might result from such failures. »

We ought to say :

« It is intended, in the first instance, to facilitate the correct observation of signals by the driver or to make good any lack of vigilance on his part. Automatic train control can be considered as an additional increase in safety as it guarantees that the operations needed if a line signal at danger be passed are carried out, although the cases of drivers not carrying out their duties in spite of the signals being repeated on the locomotive are very rare. »

We would then continue with the old wording : « It follows therefore that, generally speaking, installation of automatic train control should *not* be accompanied by removal of the fixed signals. »

The President (in French). — I feel it will be difficult to finish today. I suggest therefore we defer the discussion to a later meeting.

Mr. Duchatel (in French). — I think that if we are to discuss the subjects completely, days, not hours, will be needed. Several Congresses would be needed to study the subject completely in all its details. I therefore propose the discussion be closed or that we limit ourselves to the summaries proposed by the Bureau of the Section.

The President (in French). — Except in so far as we make a few alterations, while remaining within the same limits. I put the following proposal to you : Do you wish that we should keep within the boundaries laid down by the text suggested by the Bureau, or are we to decide that the discussion cannot be brought to a finish?

Mr. Gresley. — The summaries were put before us a long time ago and we considered them at yesterday's meeting. They have been entirely modified this morning and put on paper before us. We have had no opportunity to discuss them until the last few moments, and we feel that the summaries which have been printed and circulated should stand.

The President. — I agree, to meet Mr. Gresley's remark, that the Congress requires time to consider the text distributed this morning. It is not possible to vote on the old summaries. The discussions have led some members to alter the old text and we cannot decide that these summaries are good because opinions differ on them. I suggest we postpone the discussions to another meeting which might be held on Thursday.

Sir Henry Fowler, London Midland & Scottish Railway. — A proposal has been duly moved by Mr. Gresley and seconded by several Members. Does not the procedure require that this proposal be put to the vote?

The President. — We can always ask for a further examination. We are not obliged to vote today. We are here to endeavour to agree the summaries and we must not make it impossible for another meeting to be held.

Mr. Gresley. — With all due respect, Mr. President, the proposal put before the meeting is that the original summary of the special report should stand, and I claim that the proposal has been duly moved and seconded and we are entitled to have that voted upon. If the voting is against us, we can consider another procedure.

Mr. Hauterre, French Est Railways (in French). — Mr. Gresley's proposal is based, if I understand it correctly, on the fact that the old summaries have been known for some long time while the new ones have only just been made known to the delegates at this meeting. Under these conditions it appears to me that the best solution is to defer the discussion to a later meeting. In this way we shall have time to go fully into the old and new texts.

Mr. Bals (in French). — Seeing that most of the delegates did not have any knowledge in time of the draft text of the new proposals put forward by the Bureau, I also think that it is premature to vote now and ask that the discussion be deferred to a later meeting.

Sir Henry Fowler. — I am doubtful as to what is the procedure here, but in

English speaking countries, when a motion has been proposed and seconded, it is put to the Meeting. I ask, Mr. President, that the motion which is before us be put to the meeting immediately. I suggest that Mr. Gresley's proposal be first voted upon by the Meeting and, if it is lost, then the original proposal.

The President. — As it is suggested that the new text was not distributed soon enough, it appears to me that, if the delegates wish to examine the text more closely, we ought to see that they are not faced with any other decision.

Moreover, I consider that if we wish to discuss the old text we cannot adopt it *en bloc*, the different points must be discussed one after the other. If therefore we wish to take up the old summaries, I propose to examine them one by one as I am afraid that we may be criticised if we accept them as a whole, seeing that some of them were opposed yesterday. I propose therefore to take the summaries again one by one.

Mr. Gresley. — I take leave to remind you, Mr. President, that what is actually proposed is not to vote on the old summaries, point after point, but on these summaries taken as a whole. A proposal to this effect has been duly presented, and seconded, and I consequently request you to have my motion acted upon.

According to the result of the vote, the Meeting will be at liberty either to take up again the old summaries and examine each article separately, or decide that the new summaries will be discussed at another meeting.

Mr. Duchatel (in French). — I always thought that the main object of a meeting such as this was to exchange ideas on questions of common interest, much more so than to come to conclusions which are not satisfactory to everyone.

Moreover, I see on referring to the regulations of the Association, page 9, French text, that : « The Congress shall not vote except on questions of management or organisation », and I am rather suprised to see Sir Henry Fowler proposing to take a vote. There are not two ways of getting out of this discussion. We find it is impossible to draft a text which will be agreed to unanimously. We can only come to agreement if we are satisfied with a text limited to the general principle. We must note that is is impossible to get a unanimous vote on the text of the summaries, but it is not necessary to take a vote.

Sir Henry Fowler. — I wish to draw the attention of the Meeting to another point. Paragraph *f*, page 26, of the *Vademecum* reads :

Closure of the discussion. — In case of a prolonged discussion, a vote shall be taken, if necessary, and the discussion may be declared at an end by the meeting or by a majority of *two-thirds* of the members present. When the discussion is closed, the final summary and the amendments which have been put forward during the discussion are put to the vote, and decisions are taken in accordance with the majority of the members present.

The President (in French). — We must follow the regulations; I therefore ask you to vote on the proposal to terminate the discussions.

Sir Henry Fowler. — After the discussion will have been closed by a two-third majority vote, the proposed motions will have to be placed before the Meeting and, for this second vote, the simple majority is sufficient. It is well understood that

if we decide for closure, the motions will be put to the vote.

Mr. de Boysson, Paris-Orleans Railway (in French). — Before a vote is taken, I think it is well to be quite clear on the procedure. If the proposal to terminate the discussion be approved, the summaries would then be voted upon and, to be adopted, require a simple majority. On the other hand, it is not possible to vote on the summaries as a whole; they must be considered one by one.

Sir Henry Fowler. — I think this question may be left in suspense. The main point is whether the discussion is to be closed or not.

The President (in French). — Let us take a vote on the proposal to terminate the discussions.

(The count showed fifteen votes in favour and twelve votes against.)

The President. — In view of this result, the discussions will be continued. I suggest we meet again on Thursday next at 3 p.m. *(Approved.)*

— The sitting terminated at a quarter past one.

Meeting held on the 26 January (afternoon).

Mr. MARGOT, President of the 3rd Section, in the Chair.

— The Meeting is opened at 3 p. m.

The President (in French). — Gentlemen, I would remind you that at the end of the discussions which took place during the meeting on the 24 January, it appeared advisable to reconsider the summaries drawn up by the Special Reporter and amend them as needed to meet the remarks of certain delegates.

A text drawn up by the Special Reporter, Mr. Gresley, Lt. Col. Mount and Mr. de Boysson will now be read to you.

1. The desirability of equipping a railway system or individual lines with train control apparatus depends amongst other things upon the train speed, the intensity of the traffic, the interval between signals and the cost of installation.

Automatic train control is an important complement to the safety precautions. Its introduction is recommended on routes where it appears necessary in the light of the above considerations.

2. Train control can be effected in two ways:

a) By a simple repetition of the signals on the engine;

b) By direct action on the brakes to cause stoppage or reduction of speed.

The two devices can be utilised jointly.

3. In both cases train control should be regarded as an adjunct to the existing signalling equipment. It is intended to ensure the observance of signals in all cases where the driver fails to take notice of them, or to avoid the consequences resulting from such failures. But, in the main, safe running has to be guaranteed, as in the past, by the alertness of the driver, and it is important that this alertness should not be interfered with. It is therefore recommended in general not to remove fixed signals on lines provided with automatic train control.

4. The continuous inductive system of automatic control is capable of meeting operating and safety requirements to a some-

what greater extent than the intermittent inductive system. Sufficient information is not yet available to form the basis of a decision as to whether this advantage is or is or not outweighed by the higher cost and greater delicacy of the continuous system. The most important operating and safety conditions can be met by the intermittent system. The continuous system should be considered simply in connection with lines equipped with automatic signalling.

5. The purely mechanical method of transmission has proved a reliable method of conveying intermittent impulses from the track to the locomotive on Metropolitan systems. Where snow or other deposits on the track are liable to cause disturbances, it is desirable to arrange the transmitting apparatus at a suitable height above rail level. Difference of opinion exists as to the suitability of the purely mechanical system of transmission for fast train routes.

6. The electro-mechanical system of transmission using contact ramps has given satisfatory results in countries having temperate climates (Western Europe); in some cases, however, protection has to be provided against hoar frost. An essential condition for the employment of the electro-mechanical design is the existence of ample clearance between the underside of the vehicles and the track.

7. Various electro-inductive systems have proved reliable and not sensitive to climatic conditions on fast train routes.

8. With the continuous inductive automatic control, only inductive transmission by track circuits can be considered at present.

9. An advantage of the electro-mechanical and the inductive types of equipment, as compared to other designs, is that they do not require any operating gear on the track. In certain types of inductive equipment, it has been possible to dispense with a local supply of current.

10. The adoption of the closed-circuit principle in such a way that any failure would produce a warning indication is to be preferred on grounds of safety.

11. The chief object of automatic train control is to stop the train if a home signal is at danger. It is desirable to so design the equipment, that safeguards can be applied to ensure reductions of speed at junctions and other places where such restrictions are stipulated. Systems which give several kinds of impulses are specially suitable for this requirement.

12. In cases of railway services in which short braking distances are the rule, the consequences of the driver failing to comply with signals can be fully averted by an automatic control transmitter at the home signal, provided that the impulse causes the brakes to be applied immediately, and that the distance between the home signal and the danger point is at least equal to the full braking distance.

As a rule these conditions are not fulfilled on fast train routes; first of all, therefore, an automatic control action before reaching the stop signal is essential in such cases.

13. In types in which action begins before reaching the stop signal, a simple repetition of the signals on the locomotive, together with the device for checking the alertness of the driver, and the recorder, can be considered as sufficient. In this way the more important factor of safety is secured without interfering with the work of the driver.

14. On railways which have not adopted the preceding system, it is desirable that the application of the brakes shall also occur with automatic control transmitters before reaching the stop signal, in order to obviate the possibility of the driver making a mistake after passing the distant signal.

Only when danger exists, however, should braking be continued up to the point of complete stoppage; contrariwise, when the driver is running according to regulations, control of the speed should remain in his hands.

15. For checking the alertness of the driver, either a vigilance checking device, or an arrangement for graded speed checks are available. The vigilance check in the vicinity of the distant signal can be supplemented by a speed check that comes into operation later.

16. The vigilance checking device must enable the driver to prevent the brakes coming into operation in the neighbourhood of a distant signal. It may be an advantage, from the point of view of maintaining smooth operation if, in addition, it is possible to release the brakes subsequently. However, the alertness of the driver is better guaranteed if braking continues to the point of standstill, after he has failed to apply the vigilance checking device, and the release of the brakes can only be effected when the train has stopped.

17. With a view to maintaining proper supervision over the use of the vigilance checking device, and the existence of the control impulses, it is desirable that recording apparatus should be fitted which should, if possible, record the speed and indicate the location at which each event has occurred.

18. Designs which embody unconditional braking at a danger signal require a cancelling-out device, so that in the event of signal failures, it may be possible to run past a signal which is at danger.

19. It must be possible for the driver to cut out the automatic control apparatus in the event of faults occurring in the equipment on the engine.

(The text is read out in French, English and German.)

Has anyone any remarks to make on these summaries?

(No objection is raised.)

As no one has had anything to say about them we may consider them as adopted.

Mr. Vlaikoff, Bulgarian State Railways (in German). — I would draw the attention of the Meeting to the fact that most administrations have received a large number of suggestions for solving the problem. Usually, however, the suggested solutions emanate from people of little qualification, such as clockmakers, electricians, etc. In some cases the suggestions are put forward by engineers who usually, while not in the railway service, wish to profit by their business relations with the railway administration concerned. The result is confusion when the final decision has to be made. The solution of this problem ought not to be the result of a sudden thought : we ought not to repeat the history of Columbus and the egg; the correct solution must rather be found in the service itself. So that the railways may be protected from these undesirable and dangerous proposals, I propose we insert between summaries 1 and 2 a paragraph worded as follows :

« Of all the services of a railway, *train control*, which is closely bound up with the safety and punctuality of working, is especially selected as the object of the many and technically rather valueless proposals put forward to solve the problem. These proposals would in most cases prejudice a really practical solution of the question. It is therefore desirable to recommend that consideration be given to such solutions as are not in contradiction with the following summaries, and for which the inventor gives such ample guarantees as to justify installation, and the necessary assistance during the trials. »

The President (in French). — I think Mr. Vlaikoff's remark can be reproduced in the minutes of the proceedings, without however being included in the summaries.

He calls attention to the danger of certain tests of apparatus not developed by railway engineers. I therefore propose to mention this point in the report, but not to alter the wording of the summaries we have just read out.

Do you agree, Mr. Vlaikoff ?

Mr. Vlaikoff. — Yes.

The President (in French). — Under these conditions if there are no further remarks, the new text drawn up by the Special Reporter, Mr. Gresley, Colonel Mount, and Mr. de Boysson is adopted, and I have much pleasure in congratulating the authors thereon. *(Applause.)*

— The Meeting then terminated.

DISCUSSION AT THE PLENARY MEETING.

30 January 1933.

PRESIDENT : H. E. IBRAHIM FAHMY KERIM PASHA.
GENERAL SECRETARIES : Messrs. P. GHILAIN, YOUSSEF RISGALLAH BEY,
Dr. I. G. LEVI and FOUAD HASSIB BEY.
ASSISTANT GENERAL SECRETARIES : Sir HENRY FOWLER and Mr. P. WOLF.

Mr. Ghilain, *General Secretary*. — We will now take Question IX, which has been considered jointly by Sections II and III, the summaries being published in today's issue of the *Daily Journal of the Session*.

(The summaries are then read.)

The President. — Has anyone any remarks to make as regards these summaries ?

— As no one wishes to speak, we will take them as approved.

Summaries.

« 1. The desirability of equipping a « railway system or individual lines « with train control apparatus depends « amongst other things upon the train « speed, the intensity of the traffic, the « interval between signals and the cost « of installation.

« Automatic train control is an impor- « tant complement to the safety precau- « tions. Its introduction is recommended « on routes where it appears necessary « in the light of the above considerations.

« 2. Train control can be effected in « two ways :

« *a*) By a simple repetition of the « signals on the engine;

« *b*) By direct action on the brakes « to cause stoppage or reduction of speed.

« The two devices can be utilised « jointly.

« 3. In both cases train control should « be regarded as an adjunct to the exist- « ing signalling equipment. It is in- « tended to ensure the observance of « signals in all cases where the driver « fails to take notice of them, or to avoid « the consequences resulting from such « failures. But, in the main, safe run- « ning has to be guaranteed, as in the « past, by the alertness of the driver, « and it is important that this alertness « should not be interfered with. It is « therefore recommended in general not « to remove fixed signals on lines prov- « ided with automatic train control.

« 4. The continuous inductive system « of automatic control is capable of meet- « ing operating and safety requirements « to a somewhat greater extent than the « intermittent inductive system. Suffi- « cient information is not yet available « to form the basis of a decision as to « whether this advantage is or is not « outweighed by the higher cost and « greater delicacy of the continuous sys- « tem. The most important operating « and safety conditions can be met by « the intermittent system. The contin- « uous system should be considered « simply in connection with lines equip- « ped with automatic signalling.

« 5. The purely mechanical method of « transmission has proved a reliable me- « thod of conveying intermittent im- « pulses from the track to the locomotive « on Metropolitan systems. Where snow « or other deposits on the track are « liable to cause disturbances, it is de- « sirable to arrange the transmitting ap- « paratus at a suitable height above rail « level. Difference of opinion exists as « to the suitability of the purely me- « chanical system of transmission for « fast train routes.

« 6. The electro-mechanical system of « transmission using contact ramps has « given satisfactory results in countries « having temperate climates (Western « Europe); in some cases, however, pro- « tection has to be provided against hoar « frost. An essential condition for the « employment of the electro-mechanical « design is the existence of ample clear- « ance between the underside of the ve- « hicles and the track.

« 7. Various electro-inductive systems « have proved reliable and not sensitive « to climatic conditions on fast train « routes.

« 8. With the continuous inductive « automatic control, only inductive trans- « mission by track circuits can be con- « sidered at present.

« 9. An advantage of the electro-me- « chanical and the inductive types of « equipment, as compared to other de- « signs, is that they do not require any « operating gear on the track. In cer- « tain types of inductive equipment, it « has been possible to dispense with a « local supply of current.

« 10. The adoption of the closed cir- « cuit principle in such a way that any « failure would produce a warning in- « dication is to be preferred on grounds « of safety.

« 11. The chief object of automatic « train control is to stop the train if a « home signal is at danger. It is desir- « able to so design the equipment, that « safeguards can be applied to ensure « reductions of speed at junctions and « other places where such restrictions « are stipulated. Systems which give « several kinds of impulses are specially « suitable for this requirement.

« 12. In cases of railway services in « which short braking distances are the « rule, the consequences of the driver « failing to comply with signals can be « fully averted by an automatic control « transmitter at the home signal, prov- « ided that the impulse causes the brakes « to be applied immediately, and that the « distance between the home signal and « the danger point is at least equal to « the full braking distance.

« As a rule these conditions are not « fulfilled on fast train routes; first of « all, therefore, an automatic control ac- « tion before reaching the stop signal is « essential in such cases.

« 13. In types in which action begins « before reaching the stop signal, a sim- « ple repetition of the signals on the « locomotive, together with the device « for checking the alertness of the driver, « and the recorder, can be considered « as sufficient. In this way the more « important factor of safety is secured « without interfering with the work of « the driver.

« 14. On railways which have not « adopted the preceding system, it is de- « sirable that the application of the « brakes shall also occur with automatic « control transmitters before reaching « the stop signal, in order to obviate the

« possibility of the driver making a « mistake after passing the distant signal.

« Only when danger exists, however, « should braking be continued up to the « point of complete stoppage; contrari- « wise, when the driver is running ac- « cording to regulations, control of the « speed should remain in his hands.

« 15. For checking the alertness of the « driver, either a vigilance checking de- « vice, or an arrangement for graded « speed checks are available. The vigi- « lance check in the vicinity of the dis- « tant signal can be supplemented by a « speed check that comes into operation « later.

« 16. The vigilance checking device « must enable the driver to prevent the « brakes coming into operation in the « neighbourhood of a distant signal. It « may be an advantage, from the point « of view of maintaining smooth oper- « ation if, in addition, it is possible to « release the brakes subsequently. How- « ever, the alertness of the driver is bet- « ter guaranteed if braking continues to « the point of standstill, after he has « failed to apply the vigilance checking « device, and the release of the brakes « can only be effected when the train has « stopped.

« 17. With a view to maintaining pro- « per supervision over the use of the « vigilance checking device, and the « existence of the control impulses, it « is desirable that recording apparatus « should be fitted which should, if pos- « sible, record the speed and indicate the « location at which each event has oc- « curred.

« 18. Designs which embody uncon- « ditional braking at a danger signal re- « quire a cancelling-out device, so that « in the event of signal failures, it may « be possible to run past a signal which « is at danger.

« 19. It must be possible for the driver « to cut out the automatic control appar- « atus in the event of faults occurring « in the equipment on the engine. »

[656. 222.1]

Note on Train Speeds,

by Lionel WIENER,
Professor at the University of Brussels.

PART II. *(Continued.)* [1]

Train speeds and services in different countries.

CHAPTER X.

British train speeds.

X-1. — Generalities. — Since the middle of last century, when the coming of the *Great Northern* to London foreshadowed a general speeding up, relatively high speeds have been maintained in England as is shown by the following table, which has been compiled by the Rvd. Reginald B. Fellows.

Since then, the fine British tradition of fast and smooth running has been maintained and the quickest trains have usually been run in Great Britain, though the blue ribbon for speed has occasionally been wrested away either by the Americans (with their « Atlantic Fliers ») or others, such as the French *Chemin de fer du Nord*, and the Canadian Railways and latterly, the German « Flying Hamburger ».

Table 69.

BRITISH TRAIN SPEEDS IN 1850.

RUN.	COMPANY.	Distance		Time spent.	Speed	
		Miles.	Km		Miles/h.	Km./h.
Paddington-Didcot	G. W.	52.8	85.0	55	57.6	92.7
Waterloo-Bishopstoke (Eastleigh). .	L. S. W.	73.6	118.5	90	49.0	78.9
Euston-Wolverton	L. N. W.	52.5	84.5	R68	46.3	74.5
King's Cross-Hitchin	G. N.	31.7	51.0	42	45.3	72.9
London Bridge-Brighton	L. B. S. C.	50.5	81.3	R75	40.4	65.0
Tonbridge Jn.-Reigate (Redhill) . .	S. E.	20 0	32.2	30	40.0	64.4
Shoreditch-Bishop's-Stortford . . .	E. Counties.	32.2	51.8	R50	38.7	62 3
Edinburgh-Dundee	N. B.	29.0	46.7	45	38.6	62.2
York-Darlington	Y. N. & Berwick.	44.5	71.6	70	38.1	61.3

(1) Continued from p. 885, October 1933, and p. 1027, November 1933, *Bulletin of the Railway Congress.*

Fig. 25. — New saloon, *Great Western Railway.*

Fig. 26. — Third-class dining car, *London Midland & Scottish Railway.*

Fig. 27. — Third-class kitchen dining car, *London Midland & Scottish Railway.*

Fig. 28. — Ocean mails van and 60'-9" (18.50-m.) saloon, *Great Western Railway.*

No other country has as many high-speed lines as has England. This is due, to a large extent, to the former splitting up of the railway system among many different Companies having fifteen high-speed lines into or out of eleven distinct London termini.

Generally speaking, very fast trains having an average speed of over 58 miles (95 km.) an hour are more numerous in France than in the British Isles, but the latter have more fast, though not quite so fast, trains, over a greater number of routes than has any other Continental or overseas country.

The high speed of the Scotch and West expresses has become a byword, but in spite of this, it is often difficult to lay hands on accurate information concerning them; we will therefore deal with this subject at some length.

X-2. — **Notable runs of the four great Companies.** — Before giving the tables of fastest and non-stop runs, which are the synthesis of this paper, it is advisable to consider the various lines' most interesting runs, not only fast or long non-stop runs, but also all interesting runs of each system, whether with or without intermediate stops.

Tabulating these data has the advantage that commentary becomes superfluous and future reference for comparative purposes, when alterations brought about by varying conditions will have taken place, is easier in this form.

TABLE 70 (see fig. 8).

NOTABLE BRITISH RAILWAY RUNS. — GREAT WESTERN RAILWAY.

(See explanation, page 919/35, October 1933 issue.)

RUN.	Distance		Time of departure.	Time spent.	Speed		
	Miles.	Km.			Miles/h.	Km./h.	
Great Western Ry.							
Paddington-Penzance	305.3	491.3	10.30 a.m.	6.30	47.0	75.6	5 stops.
Paddington-Reading	36.0	57.9	Various	0.40	54.0	54.0	
Do. -Didcot	53.3	85.7	11.15 a.m.	0.57	54.3	91.7	
Do. -Slough	18.5	29.8	Various.	0.23	48.2	77.5	
Do. -Swindon	77.3	124.4	4.30 p.m.	1.19	58.9	95.4	
Do. -Swindon			R 3.55 p.m.	1.05	71.4	114.9	Cheltenham Flier.
Do. -Westbury	95 6	153.9	R 10.11 a.m.	1.34	60.4	97.2	
Do. -Trowbridge	97.0	156.1	10.30 a.m.	1.52	51.8	83.4	
Do. -Taunton	142.9	230.0	1.40 a.m.	2.20	61.2	98 5	
Do. -Exeter St. Dav.	173.7	279.6	12.00 noon	2.50	61.3	98 7	Torbay Express.
Do. -Newton Abbot	193.9	312.0	11.00 a.m.	3.20	56.8	91.4	
Do. -Plymouth	225.7	363.4	10 30 a.m.	3.57	57 6	92.7	Cornish Riviera.
Reading-Exeter	137 7	221.6	R 1.30 p.m.	2.20	59 0	94.9	
Paddington-Chippenham (Bristol)	94 0	151.3	6.30 p.m.	1.39	57 0	91.7	
Paddington-Badminton	100.0	160.9	1.20 p.m	1.50	54.5	87.7	
Do. -Bath	106.9	172 0	11.15 a.m.	1.44	61.7	99.3	
Do. -Bristol T. M.	118.3	191.2	1.15 p.m	1.56	61 2	98.5	
Do. -Badminton-Bristol	117.6	189.2	R 11.45 a.m	2.00	58.8	94.6	
Swindon-Bath	29.6	47.7	5.54 p.m.	0.30	59.2	95.2	

TABLE 70 (*continued*).

NOTABLE RUNS ON THE GREAT WESTERN RAILWAY.

RUN.	Distance Miles.	Distance Km.	Time of departure.	Time spent.	Speed Miles/h.	Speed Km./h.	
Paddington-Weymouth.	154.5	248.6	7.30 p. m.	3.10	48.8	78.5	
Paddington-Taunton-Ilfracombe	203.8	328.0	R 10.30 a. m.	5.05	40.9	65.8	
Paddington-Newton Abbot-Torquay	199.7	322.4	12.00 noon	3.35	56.2	90.4	
Paddington-Plymouth-Newquay.	281.0	450.8	10.40 a. m.	6.05	46.2	74.3	
Paddington-Severn Tunnel-Fishguard.	261.3	420.5	7.55 p. m.	5.47	45.2	72.7	
Paddington-Newport	133.4	214.7	11.55 a. m.	2.25	55.2	88.8	
Paddington-Gloucester-Cheltenham	121 5	195.5	R 2.40 p. m.	2.20	52.1	83.6	4 stops.
Paddington-Kemble.	91.0	146.4	5.00 p. m.	1.30	60.6	97.6	Cheltenham Flier.
Paddington-Oxford-Worcester	120.5	193.9	12.45 noon	2.10	55 6	88.6	
Moreton in the Marsh-Oxford.	*28.3*	*45.6*	*9.35 a. m.*	*0.29*	*58.0*	*93.4*	*In 1932.*
Paddington-Birmingham-Chester	195.0	313.8	12.30 night	5.19	36.7	59.0	
Paddington-Banbury	67.5	105.7	R 3.54 p. m.	1.11	57 0	91.7	
Do. -Leamington Spa	87.3	140.5	11.10 a. m.	1.30	58.2	93.6	
Leamington Spa-Banbury	22.8	36.7	10.42 a. m.	0.24	57.0	91 7	
High Wycombe-Birmingham	84.1	135.3	9.43 a. m.	1.27	58.0	93.3	

NOTABLE RUNS ON THE SOUTHERN RAILWAY.

Southern Ry.							
Waterloo-Plymouth-Barnstaple Jn.	210.3	338.4	11.00 a. m.	4.39	48.7	78.3	Atlantic Coast Exp.
Waterloo-Plymouth N. Rd.	230.7	371.2	Do.	5.14	44.1	80.0	Do.
Waterloo-Basingstoke	47.7	76.7	R 3.26 p. m.	0.53	54 0	86 9	
Do. -Andover Jn.	66.3	106.7	R 4 58 p. m.	1.13	54.5	87.7	1 stop.
Do. -Salisbury.	83.6	134.6	3.00 p. m.	1.27	57.7	92.8	
Do. -Exeter, Queen St.	171.8	276.5	11.00 a. m.	3.14	53.1	85.4	Do. (1 stop).
Waterloo-Weymouth	142.6	229.5	R 7.32 a. m.	3.08	45.6	73.4	Bournemouth Ltd. (3 stops).
Waterloo-Winchester	66.5	107 0	R 10.21 a. m.	1.15	53.2	85.8	
Do. -Southampton West	79.2	127.4	10.30 a. m.	1 29	53.4	85.9	Bournemouth Belle
Do. -Bournemouth Central	108.0	173.8	4.30 p. m.	2.00	54 0	86 9	Bournemouth Ltd.
Waterloo-Guildford-Portsmouth	73 8	118.8	1.50 p. m.	1.40	44.3	71.3	
Victoria-Brighton	50.8	81.8	11.00 a. m.	1.00	50.8	81.8	Southern Belle.
East Croydon-Brighton	40 4	65.1		0.46	52.7	84.8	(1931)
London Bridge-Brighton	50.5	81.3	5.00 p. m.	1.00	50.5	81.3	City Ltd.
Victoria-Eastbourne.	65 6	105.6	10.45 a. m.	1.20	49.2	79.2	
Victoria-Bognor Regis	67.0	107.8	1 32 p. m.	1.52	35 9	57.7	
Victoria-Newhaven Hr.	56.5	90.9	10.05 a. m.	1.21	41.8	67.3	1 stop.
Victoria-Dover Marine	80.0	128.7	11.00 a. m.	1.05	51.1	82.2	Golden Arrow.
Charing Cross-Folkestone	69.9	112.3	7.15 p. m.	1.20	52.4	84.3	
Waterloo Junction-Folkestone	69.1	111.1	R 5.10 p. m.	1.16	54 6	87 9	
			3.15 p. m.	1.35	48.9	78.7	
Victoria-Margate.	74.0	119.1					
Cannon St.-Margate	77.5	124.4	5.04 p. m.	1.33	50.0	80 5	

TABLE 70 (*continued*).

NOTABLE RUNS ON THE LONDON AND NORTH EASTERN RAILWAY.

RUN.	Distance		Time of departure.	Time spent.	Speed		
	Miles.	Km.			Miles/h.	Km./h.	
London and North Eastern Ry.							
King's Cross-Inverness	558.8	899.3	7.25 p.m.	13.20	41.9	67.4	
King's Cross-Aberdeen	523.5	842.4	10.00 a.m.	11.30	45.5	73.2	Flying Scotsman.
Do. -Glasgow	440.3	708.6	10.00 a.m.	8.53	49.6	79.9	Do.
Do. -Edinburgh	392.7	631.9	10.00 a.m.	7.30	52.4	84.3	Do.
Do. -Huntingdon	58.9	94.8	R 9.30 a.m.	0.58	60.9	98.0	
Do. -Peterborough	76.4	122.9	R 3.03 a.m.	1.18	58.9	94.8	
Do. -Grantham	105.5	169.4	R 9.40 a.m.	1 40	63.3	101.9	
Do. -York	188.2	302.6	11.50 a.m.	3.15	57.4	93.3	Scarborough Flier.
Do. -*Darlington*	*232.2*	*373.6*					
Do. -*Newcastle*	*268.7*	*432.4*					
Do. -Edinburgh	393.0	632.4	10.00 a.m.	7.30	52.4	84.3	Flying Scotsman.
Grantham-York	82.8	133.3	7.24 p.m.	1.29	55.7	89.6	
York-Darlington	44.1	70.9	R 9.07 a.m.	0.43	61.5	99.0	
Do. -Newcastle Central	80.5	129.5	3.18 p.m.	1.20	50.3	81.0	
Newcastle-Drem	106.6	171.5	4.46 p.m.	2.04	51.7	83.2	
Do. -Edinburgh	124.4	200.4	11.10 a.m.	2.25	51.5	82.9	
Do. -Glasgow	171.8	276.5	4.26 a.m.	4.21	39.9	64.3	
Edinburgh-Dundee	59.2	95.2	4.05 a.m.	1.20	44.4	71.4	
Do. -Polmont	22.3	35.9	R 10.49 a.m.	0.26	51.5	82.9	
King's Cross-Leeds-Glasgow Q. St.	453.6	730.0	11.20 a.m.	9.00	50.4	81.1	Queen of Scots.
King's Cross-Leeds-Edinburgh W.	406.3	653.8	11.20 a.m.	7.55	51.3	82.6	Do.
Do. -Leeds	185.7	299.0	R 4.02 p.m.	3.12	58.1	93.4	Do.
Do. -*Harrogate* (1)	*198.0*	*319.0*					
Do. -Wakefield-W.	175.8	282.9	4.45 p.m.	3.07	57.2	92.0	W. Riding Pullm.
King's Cross-York-Scarborough	230.0	370.0	11.53 a.m.	4.00	57.5	92.5	Scarborough Flier.
King's Cr.-Boston S.-Grimsby Tower	154.8	249.1	4.00 p.m.	3.33	43.6	79.2	
Former Great Eastern Ry.							
Liverpool St.-King's Lynn							
Liv. St.-Bishop's St.-Cambridge	58.8	94.6	11.50 p.m.	1.07	52.7	84.8	1 stop.
King's Cross do. do.	55.5	89.3	R 7.38 p.m. Su.	1.15	44.3	70.6	
Bishop's-Stortford-Cambdrige	25.3	40.7	5.30 p.m.	0.30	50.6	86.4	
Liverpool St.-N. Walsham (Cromer)	130.2	210.8	12.25 noon	2.39	49.1	79.0	
Do. -Beccles-Yarmouth	121.8	196.0	12.30 noon	2.30	48.7	78.3	
Do. -Beccles-Lowestoft	117.8	189.6	12.56 noon	2.40	44.2	71 4	
Do. -Parkeston Quay	68.8	110.7	8.20 p.m.	1.27	47.4	76.2	
Do. -Thorpe-Clacton	70.8	113.9	9.55 a.m.	1.30	47.2	75.8	
Former Great Central Ry.							
Marylebone-Manchester Ln. Rd.	206.0	331.8	4.55 p.m.	4.05	50.2	80.8	3 stops.
Marylebone-Aylesbury-Leicester-C.	103.1	165.7	4.55 p.m.	1.48	57.3	92.2	
Do. -High Wycombe-Leicest. C.	107.6	173.1	6.20 p.m.	1.54	56.6	91.1	
Leicester C.-Nottingham Vict.	23.4	37.6	6.47 p.m.	0.24	58.5	94.1	
Do. -Arkwright St.	*22.6*	*36 4*	*4.30* a.m.	*0.22*	*61.5*	*99.0*	*1932*
Aylesbury-Leicester	*65.1*	*104.8*	*11.48* p.m.	*1.05*	*60.1*	*96.7*	
Rugby-Leicester	19.9	32.0	4.06 a.m.	0.20	59.7	96.0	
Leicester-Sheffield Vict.	61.8	99.5	12.57 night	1.13	50.8	81.8	

(1) Via Wakefield, the distance is 203.8 miles (327.4 km.).

TABLE 70 (*continued*).

NOTABLE RUNS ON THE LONDON MIDLAND AND SCOTTISH RAILWAY.

RUN.	Distance		Time of departure.	Time spent.	Speed		
	Miles.	Km.			Miles/h.	Km./h.	
London Midland and Scottish Ry.							
Euston-Perth-Oban	503.8	810.8	7.30 p. m.	13.25	37.6	60 5	
Euston-Stirling-Inverness	568	913.9	7.20 p. m.	13.25	42.2	66.2	Royal Highlander.
Euston-Stirling-Aberdeen	540.0	868.0	10 00 a. m.	11.55	45.3	72.9	Royal Scot (18 stops)
Euston-Symington-Edinburgh	400.0	643.7	R 10 00 a. m.	7.40	51.7	84.0	Do.
Euston-Symington-Glasgow	401.5	646.1	R 10.00 a. m.	7.40	51.7	83.2	Do.
Euston-Bletchley	46.8	75.3	4.10 p. m.	0.52	56.3	89.0	
Do. -Blisworth	62.8	101.3	4.30 p. m.	1.04	58.9	94.7	
Do. -Rugby	82.5	132.8	2.40 p. m.	1.28	56.3	90.6	
Do. -Nuneaton	97.1	156.3	R 6.22 p. m.	1.48	54.0	86.9	
Do. -Stafford	133.6	215.0	R 6.48 p. m.	2.07	63.1	101.5	The Comet.
Do. -Crewe	158.1	242.8	R 10.35 a. m.	2.40	59.2	95.2	
Do. -Carlisle	299.0	481.2	...	5.34	53 7	86.4	
Do. -Glasgow	401.5	646.1	R 10 00 a. m.	7.40	51.7	83.2	Royal Scot.
Willesden Jn.-Rugby	77.3	124.4	8.41 a. m.	1.23	56.0	90 1	Irish Mail.
Do. -Crewe	152.5	245.4	R 6.12 p. m.	2.22	64.4	103 8	Night Scot.
Crewe-Carstairs	*214 6*	*345.4*	*10.32* p. m.	*4.24*	*48.8*	*78.5*	(1931).
Do. -Glasgow	243.3	391.5	R 10.30 p. m.	5.20	45.6	73.2	Night Scot.
Do. -Stirling-Perth	291.8	469.6	10.32 p. m.	6.18	46.3	74.5	
Do. -Edinburgh.	242.0	389.4	R 10.00 a. m.	5.30	44.0	70.8	Royal Scot.
Carlisle-Glasgow.	102 3	164 6	10.00 a. m.	2.06	50.1	80 6	
Do. -Symington	66.8	107.6	R 2.25 p. m.	1.14	54 7	88.0	
Do. -Edinburgh	100.6	161.9	R 5.29 a. m.	2.14	45.0	72.4	
Forfar-Perth	*32.5*	*52.3*	...	*0.32*	*60 5*	*97.4*	
Glasgow-Aberdeen	153.0	246.2	9.30 a. m. Su.	3 33	43.1	69.4	
Euston-Birmingham-Wolverhampton	125.8	202.4	11.30 a. m.	2.30	50.3	81.0	Stops.
Euston-Birmingham	112.8	181.5	11.30 a. m.	2.00	56.4	90.8	1 stop.
Do. -Coventry.	94.0	151.3	5 50 p. m.	1.35	59.4	95 6	
Willesden Jn.-Coventry	88.6	142.4	R 5.12 p. m.	1.27	61.1	98.3	
Do. -Birmingham	107.5	173.0	9.20 a. m.	1.50	58.6	94.3	
Wolverhampton-Crewe.	39.5	63.6	8.53 a. m.	0.45	52 7	84.8	
Euston-Crewe-Holyhead	263 6	424.5	R 12.27 noon	5.12	50.7	81.6	Irish Mail.
Euston-Prestatyn	205.5	330.8	11.15 a. m.	3.40	56 0	90.1	
Do. -Rhyl	209.3	336.9	11.15 a. m.	3.19	63.1	101.5	The Welshman.
Do. -Colwyn Bay	219 8	353 7	R 12.06 noon	4.54	45.0	72.4	
Euston-Crewe-Liverpool L. St.	193.8	311.9	R 5.25 p. m.	3.20	58 1	93.4	2 stops.
Euston-Liverpool L. St.	193.8	311.9	6.05 p. m.	3.35	54.0	86.9	Merseyside Exp.
Euston-Crewe-Manchester L. Rd.	188.5	302.6	6.00 p. m.	3.15	58.0	93.3	
Euston-Wilmslow	176.9	284 8	R 10.08 a. m.	2.52	58.0	99.3	Lancastrian.
Do. -Stockport	183.5	294.5	R 2.32 p. m.	3.28	52.3	84.2	

TABLE 70 (*continued*).

NOTABLE RUNS ON THE LONDON MIDLAND AND SCOTTISH RAILWAY.

RUN.	Distance		Time of departure.	Time spent.	Speed		
	Miles.	Km.			Miles/h.	Km./h.	
Euston-Stoke-Manchester L. Rd. . .	183.5	295.3	R 12.05 noon	3.40	50.0	80.5	Lancastrian.
Euston-Stoke-on-Trent.	146.0	235.0	R 1.15 p.m.	2.30	58.4	93.9	Do.
Euston-Carlisle-Stranraer.	405.0	651.7	8.30 p.m.	9.22	43.3	69.7	(St.) Roy. Highlander.
St. Pancras-Glasgow St. Enoch. . .	426.0	685.9	9.00 a.m.	8.50	47.6	76.6	9 st. Thames Forth Ex.
St. Pancras-Nottingham-Glasgow . .	...	...	10.00 a.m.	8.50	...	...	Thames Clyde Exp.
St. Pancras-Kettering	72.0	115.9	6.25 p.m	1.14	58.4	94.0	
Do. -Leicester Ln. Rd. . .	99.1	159.3	10.00 a.m.	1.46	56.0	90.1	
Do. -Nottingham	123.5	198.7	9.00 a.m.	2.09	57.4	92.3	
Do. -Trent Jn.	119.8	193.6	6.15 p.m.	2.09	55.7	89.6	
Do. -Chesterfield	*146.3*	*235.4*	R *2.10* p.m.	*2.43*	*53.9*	*95.7*	(1931)
Luton-Kettering	41.8	67.3	R 9.02 a.m.	0.43	56.3	90.6	
Do. -Bedford	19.6	31.6	11.36 a.m.	0.20	58.8	94.6	
Carlisle-Dumfries-Glasgow . . .	115.5	186.4	12.58 noon	2·25	47.9	77.0	
Dumfries-Kilmarnock	58.3	93.8	1.39 a.m.	1.06	53.0	85.2	
Euston-W. Coast Carlisle - Dumfries-Glasgow C.	415.0	662.2	12.35 night Su.	9.01	46.0	74.0	Night Scot.
Leeds Well-Birmingham-Bristol . .	206.0	332.0	10.47 a.m.	4.50	42.6	68.6	

X-3. — **High-speed lines.** — We will first take the three Northern lines : the East Coast, the Midland and the West Coast Routes, over which 26 daily fast expresses run between London, Glasgow and Edinburgh, an extraordinary array over such a distance as 400 miles (643 km.). The *L. N. E.* accounts for a dozen, including four reliefs, the *L. M. S.* for eight others (including three reliefs) along the West Coast and for six (including one relief), along the Midland Route. The distances and best times by the various routes are given in table 41.

Besides these through trains, there are, a number of others such as the *L. N. E.*'s Scarborough and Leeds trains, the *L. M. S.*'s Holyhead, Liverpool and Manchester expresses, which follow the main line part of the way and then branch off.

The *G. W.* also has always had very fast services and has often, as now, run the fastest train in the World.

But a more unusual fact is the running of very fast North to West trains over such cross country routes as the *G. W.*'s and the *L. M. S.*'s Birmingham-Bristol and Shrewsbury-South Wales lines.

The weight of the trains has increased continuously until a year or so ago, and Great Britain is no exception to this tendency. From some 200 tons in the early years of this century, the weight of the fastest expresses has risen to 500 tons and over, though 500 tons is a limit which it is endeavoured not to exceed. It should be remembered, in this connection, that many of the main lines have long and heavy gradients which are not to be found on the French *Nord* and *Est* Railways. On the other hand, piloting is no rare occurrence in Great Britain, whereas

it is practically non existent in France and in Belgium. On the *L. M. S.*, for instance, special authorisation must be obtained for exceeding the following limits above which drivers may ask for a pilot.

Class 6. — Special limit trains, drawn by « Royal Scots ». . . 450 tons.
Class 5 X. — « Baby Scots » or « rebuilt Claughtons » . . . . . 390 do.
Class 5. — Non rebuilt « Claughtons » . . . . . 345 do.
Limited loads : 495, 430 and 380 tons respectively.
Full-load trains : 500 and 485 tons (Classes 6 and 5 X only).

These loads are reduced over highly graded lines such as the main line north of Carnforth, where the Shap and Beattock banks occur, the latter having, for 10 miles (16 km.) gradients of 1 in 69 to 1 in 88 (14.5 mm. to 11.4 mm. per m.). Thus the limited load is reduced to 420, 390 and 320 tons respectively and beyond Beattock, to 330, 290 and 255 tons only for trains running non-stop through Beattock and 30 tons less for stopping trains.

It comes as a surprise to find such heavy gradients on these high-speed lines, but others are not much better. Between Newton Abbot and Plymouth, for instance (*G. W. R.*), there are 2 miles (3.2 km.) of 1 in 42 (24 mm. per m.), and even a short length of 1 in 36 (28 mm. per m.).

Another noteworthy point is the considerable increase of tonnage of class 5 X trains, due to the rebuilding of the « Claughtons ». The same improvement is to be found in France since the rebuilding along the same line, of *P. O.* locomotives, and others of the *Nord* and *P.-L.-M.*

Three only of the great Companies run fast trains over considerable distances, the *Southern Ry.* being handicapped in this respect, its long non-stop runs occurring over lines having an easy section for some distance only and a hard one beyond. Were we to quote speeds between passing points, instead of start to stop runs, this Company would have as good a showing as the others as is instanced in the case of the Weymouth 7.30 a.m. up train :

RUN.	Time spent.	Distance		Speed	
		Miles.	Km.	Miles/h.	Km./h.
Basingstoke (pass) to Waterloo (stop). .	0.44	47.7	76.7	61.0	98.2
Do. to Woking Jn. (pass).	0.20 1/2	23.1	37.2	67.5	108.6
Woking Jn. (pass) to Hampton C. (pass).	0.10	11.3	18.2	68.6	110.4

Both the *G. W.*'s main line and its chords and cut-offs are high-speed lines in spite of the gradients being anything but easy. Both Bristol routes, for instance, require hard work. Via Bath, the gradients reach 1 in 100 (10 mm. per m.) [1] and via Badminton, 1 in 75 (13.3 mm. per m.) [2], both being against up trains.

The Westbury chord is no easier and between Frome and Castle Cary, has gradients for down trains falling of 1 in 78, 81 and 79 (12 to 13 mm. per m.) and against these trains, of 1 in 80 (12.5 mm.

(1) At Daunstey and at Box.

(2) From Filton Jn. to Stapleton Rd.

per m.) from Wellington to the Whitehall tunnel. Beyond Exeter, conditions are worse still, there being gradients of 1 in 40 (25 mm. per m.) (1) against the load and of 1 in 42 (23 mm. per m.) in favour of it (2).

In spite of this, the « Cornish Riviera Express » manages to maintain between Paddington and Plymouth, an overall speed of 57.6 miles (92.7 km.) per hour, which is a remarkable achievement. These conditions are not sufficiently insisted upon when comparing British and Continental practice.

Beyond Plymouth, the country undulates and the line follows its fluctuations, ruling gradients of 1 in 55 to 1 in 80 (18 to 12.5 mm. per m.) being met with in both directions.

X-4. — **Short fast runs.** — For many years, past, very fast runs have taken place over certain specially selected short stretches of railway such as the *Caledonian Ry.'s* Forfar to Perth line (32.5 miles = 52.3 km.) (3), the *North Eastern's* York and Darlington (44 miles = 70.8 km.), the *London and South Western's* Wareham and Dorchester (15 miles = 24 km.), and especially, the *Great Western's* Swindon and Paddington 71.4-mile (113.9 km.) run.

It would hardly be possible to find a stretch of line better adapted than the latter to high-speed running. Swindon being 270 feet (83 m.) higher than Paddington, the average fall is 1 in 1515 or 3.48 feet (0.7 mm. per m.) per mile, whereas actual gradients range from 1 in 660 (8 feet per mile or 1.5 mm. per m.) to 1 in 1 760 (3 feet per mile or 0.5 mm. per m.). This enables very high speeds to be obtained, and a high average, without any excessive maximum speed, to be easily maintained. Owing to these exceptionally favourable conditions, the *G. W. R.* runs the fastest train in the World and with a sufficient margin of speed to draw upon for making up lost time should this be necessary. There being no service slacks, a running speed of 81.6 miles (131.4 km.) an hour, without exceeding a maximum of 92.3 miles (148.6 km. per hour) has been reached.

This is accomplished by the *Cheltenham Flier*, the run of which, as far as Swindon, is in no way noteworthy. For, on this portion of its trip, it is timed to cover 44.3 miles (71.3 km.), three stops included (1) in 1 h. 11 m. which works out at 37.4 m. (60.1 km.) an hour. But a metamorphosis then occurs and its Swindon-Paddington run becomes remarkable, thanks to the line's favourable conditions. The present timing has been reached by gradual curtailment and the lopping of a few minutes at a time off the various timings, sometimes so as to beat another train's speed, at others, for well understood advertising purposes.

In 1926, the « Cheltenham Flier »'s Swindon-Paddington run was accomplished in 75 minutes during the Summer season (61.8 miles = 99.5 km. per hour), and in 80 minutes in Winter (2).

During the Summer of 1929, the time

(1) From Aller Jn. to Dainton. Then comes, between Totnes and Rattery, a bank with a 1 in 47 (21 mm. per m.) gradient.

(2) From Hemerdon to Tavistock Jn.

(3) This run was made in 32 minutes, at an average speed of 60.5 miles (97.4 km.) an hour; it has now been eased out to 36 minutes.

(1) Leaves Cheltenham Spa at 2.40 p. m.; stops at Gloucester, Stroud and Kemble and reaches Swindon at 3.51 p. m.

(2) In 1923, a trial trip was run in 72 minutes, at an average speed of 64.1 miles (103.1 km.) an hour.

TABLE 71.

FASTEST RUNS IN GREAT BRITAIN.

COMPANY AND RUN.	Distance		Time of departure.	Time spent.	Speed		
	Miles.	Km.			Miles/h.	Km./h.	
Great Western Ry.							
Paddington-Swindon.	77.3	124.4	R 3.55 p. m.	1.05	71.4	114.9	Cheltenham Flier.
Do. -Bath	106.9	172.0	11.15 a. m.	1.44	61.7	99.3	
Do. -Exeter (Plymouth). . .	173.7	279.6	12.00 noon	2.50	61.3	98.7	Torbay Express.
Do. -Bristol	118.3	191.2	1.15 p. m.	1.56	61.2	98.5	
Do. -Kemble (Gloucester) . .	91.0	146.4	5.00 p. m.	1.30	60.6	97.6	Cheltenham Flier.
Do. -Badminton-Bristol . . .	117.6	189.2	R 11.45 a. m.	2.00	58.8	94.6	
Do. -Leamington Spa . . .	87.3	140.5	11.10 a. m.	1.30	58.2	93.6	
High Wycombe-Birmingham. . .	84.1	135.3	9.43 a. m.	1.27	58.0	93.3	
Paddington-Plymouth	225.7	363.4	10.30 a. m.	3.57	57.6	92.7	Cornish Riviera Express.
London Midland & Scottish Ry.							
Willesden Jn.-Crewe.	152.5	245.4	R 6.12 p. m.	2.22	64.4	103.8	Night Scot.
Euston-Rhyl (Holyhead)	209.3	336.9	11.15 a. m.	3.19	63.1	101.5	
Willesden Jn.-Coventry (Birm.) . .	91.0	142.4	5.00 p. m.	1.30	60.6	97.6	Cheltenham Flier.
Euston-Coventry (Birm.). . . .	94.0	151.3	5.50 p. m.	1.35	59.4	95.6	
Do. -Crewe	158.1	242.8	R 10.35 a. m.	2.40	59.2	95.2	
(St. Pancras) Luton-Kettering. . .	41.8	67.3	R 9.02 a. m.	0.43	56.3	90.6	
Willesden Jn.-Birmingham . . .	107.5	173.0	9.20 a. m.	1.50	58.6	94.3	
St. Pancras-Kettering	72.0	113.9	6.25 p. m.	1.14	58.4	94.0	
Euston-Crewe-Manchester	188.5	302.6	6.00 p. m.	3.15	58.0	93.3	
St. Pancras-Nottingham	123.5	198.7	9.00 a. m.	2.09	57.4	92.3	
London & North Eastern Ry.							
King's Cross-Grantham	105.5	169.4	R 9.40 a. m.	1.40	63.3	101.9	
York-Darlington	44.1	70.9	R 9.07 a. m.	0.43	61.5	99.0	
Leicester-Arkwright St.	*22.6*	*36.4*	*4.30* a. m.	*0.22*	*61.5*	*99.0*	*(1932)*
Aylesbury-Leicester	*65.1*	*104.8*	*11.48* p. m.	*1.05*	*60.1*	*96.7*	
King's Cross-Leeds	185.7	299.0	R 4.02 p. m.	3.12	58.1	93.4	Queen of Scots.
Southernn Ry.							
Waterloo-Salisbury	83.6	134.6	3.00 p. m.	1.27	57.7	92.8	

was brought down to 70 minutes, thus increasing the average speed to 66.2 miles (106.5 km.) per hour, the same as the former American « Atlantic Fliers ». But in 1931, the Canadian Railways having entered the lists with trains running at 68.9 miles (110.8 km.) per hour, the *G. W.* found itself, in duty bound, obliged to do better. Thus, from September 14th onwards, the « Cheltenham Flier »'s timing was again improved upon and cut down to 67 minutes, giving an average speed of 69.2 miles (111.3 km. per hour).

As usual, the maiden trip and the first few journeys were accomplished under schedule time, thus drawing further attention to these runs, and showing that a 67-minute timing, be it ever so fast, could still be bettered. Thus the trial run of September 12th took 61 minutes

8 seconds only (1) and the maiden trip of September 14th, when 35 lb. per mile of fuel were burnt, but 59 minutes 30 seconds (2).

On September 15th and 16th, the run only took 58 minutes (3), and thereafter was accomplished according to schedule, but even then, a speed of 80 miles (128.7 km.) an hour had to be maintained continuously for 67 miles (107.8 km.) (4).

This was no difficult task and the accumulated late arrivals for the 78 first runs totalled 7 minutes only.

The « Flier » became so popular that, in 1931, its 8 coaches had grown to 10 and sometimes, more. In spite of this, the coal consumption did not exceed 35 to 40 lb. per mile (10 to 11 kgr. per km.) (5).

(1) In spite of permanent way slacks at Didcot, the train consisting of 8 carriages, weighing 249 tons net and 265, gross, was hauled by a four-cylinder ten-wheel Castle Class locomotive.

A speed of 60 miles (96.6 km.) an hour was already reached at the 3rd milepost from Swindon, of 75 miles (120.1 km.), at the 7th, and of 80 miles (128.7 km.), at the 11th. A maximum speed of 86 miles (138.4 km.) was reached at Steventon.

(2) This was with a 6-coach train, weighing 180 tons empty. As usual, the 60-mile (96.6 km.) speed was reached at the 3rd milepost, but 80.3 miles (129.2 km.) was reached at the 6th, 86.5 (139.2 km.), at Challow and the maximum speed of 89.1 miles (143.3 km.) was maintained for 3 miles at Ealing. The 70 miles (112.6 km.) from the 72nd to the 2nd milepost (115.9th to the 3.2nd km.) were covered in 50 m. 5 s., at the rate of 83.8 miles (134.9 km.) per hour, without the speed ever falling below the 80 miles (128.7 km.) per hour limit, which enabled the train to reach Paddington 7 and a half minutes early.

(3) On the second day of the new timing, there were 7 coaches weighing 219 tons.

(4) Actually, the average speed between Shrivenham and Ealing was 85.8 miles (138.3 km.) an hour, with a maximum of 90 miles (144.8 km.), and a minimum of 79.5 miles (127.9 km.) an hour.

(5) The train was always hauled by « Castle » Class locomotives with 6 ft.-6 1/2 in. drivers, 31 626 lb. (14 345 kgr.) tractive force and a weight of 289 500 lb. (131 metric tons).

As the 58-minute runs of September 15th and 16th had not been officially logged a new trial run took place on June 6th, 1932, so as to beat the *Reading Railroad*'s former record of 42 m. 33 s. for the 55.5 miles (89.3 km.) from Camden (N. J.) to Atlantic City (N. J.), which worked out at 78.3 miles (126 km.) an hour.

The new *G. W.* run was accomplished in 56 m. 47 s. at an average speed of 81.6 miles (131.4 km.) an hour. This entailed a 90-mile (144.8 km.) average for 39 miles (62.8 km.), including 28 miles (45.1 km.) between the 60th and 32nd mileposts (96.5th and 51.5th km.) at a still higher rate. A speed of 92.3 miles (148.5 km.) was maintained over the level section stretching between the 5th and 44th mileposts (8th to 70.8th km.). Scooping water out of the troughs brought the speed along the next mile (43rd to 44th = 69.2th to 70.8th km.) down to 89.1 miles (143.3 km.) per hour.

So far, speed trials had only been undertaken with up trains, but on September 14th, a down train was experimentally used and stopped at Swindon for the purpose. The run was accomplished in 60 m. 1 s., at the rate of 77.3 miles (124.4 km.) per hour (1), which is decidedly

(1) This 6-coach train weighed, it is true, but 199 tons.

Reading (36th mile = 57.9th km.) was passed in 29 minutes, speed so far having averaged 74.5 miles (120 km.) an hour. Didcot (53.1 miles) = 85.4 km.) was passed in 41 m. 23 s., the average speed having reached 77 miles (123.9 km.) an hour.

An average speed of 82 miles (132 km.) per hour was maintained between the 60th and 76th mileposts (97th and 122.3rd km.), and of 84 to 85.3 miles (135.2 to 137.3 km.) per hour between the 49th and 56th mileposts (78.9th to 90.1st km.), over a slightly rising gradient of 0.066 to 0.133 %.

The highest speed was 86.5 miles (139.2 km.) an hour over a level section between the 17th and 18th mileposts (27.3th and 29th km.).

more remarkable than the up trains', the quick acceleration being one of the most notable points :

Mile.	Speed miles/h.	Km.	Speed km./h.
1st	27.6	1.6	44.5
2nd	55.7	3.2	89.6
3d	66.6	4.8	107.2
4th	73.2	6.4	117.8
5th	76.9	8.0	123.7
6th	80.9	9.7	130.1
7th	82.5	11.2	132.8
7th to 11th	over 82.5	11.2nd to 17.7th	over 132.8

On and after September 12th, 1932, two minutes have further been knocked off previous schedules, so that the run now takes place in 65 minutes only, the average speed working out at 71.35 miles (114.9 km.) per hour. The maiden trip was made in 61 minutes only, at an average speed of 76.1 miles (122.5 km.) per hour.

X-5. — **Special runs.** — We have previously quoted (page 893/9) a number of remarkable runs to the credit of certain special trains, but this subject cannot be touched upon without referring to the races to Scotland which took place in 1888 and in 1895. True, they had no immediate repercussion on train speeds at the time, but they taught quite a number of object lessons. For the first time, start to stop speeds of 60, and even 62 and 63 miles an hour were reached and maintained over distances of several hundreds of miles. And for the first

TABLE 72.

THE CHELTENHAM FLIER'S AVERAGE SPEED

over its non-stop runs from SWINDON (77.3rd mile = 124.4th km.) to PADDINGTON.

Exceptional runs such as trial or experimental runs are shown in italics.

DATE.	Regular or exceptional run.	Up or down train.	Time spent.	Speed		Weight of train	
				Miles/h.	Km /h.	English tons	Metric tons
1923	*Trial run.*	Up train.	*72'*	*64.5*	*103.8*	*230*	*234*
1926	Summer timing.	Do.	75'	61.8	99.5		
	Winter do.	Do.	80'				
8-7-1929	Summer do.	Do.	70'	66.2	106.5		
1929 Summer.	(1).	...	...	...	...	...	
12-9-1929	*Trial run.*	Do.	*61'8"*	*75.9*	*122.1*	*249*	*253*
19-9-1931	*Inaugural.*	Do.	*59'5"*	*78.0*	*125.5*	*180*	*183*
15 and 16 do.	*Do.*	Do.	*58'* (2)	*79.9*	*128.5*	*219*	*223*
17 etc. 1931	Regular timing.	Do.	67'	69.3	111.5	185	188
6-6-1932	*Record run.*	Do.	*56'47"*	*81.6*	*131.4*	*185*	*188*
14-9-1932	*Trial run.*	Down train.	*60'1"*	*77.3*	*124.4*	*199*	*202*
1933 Summer.	Regular timing.	Up train.	65'	71.4	114.9		

(1) Canadian speeding up. (2) Unofficial.

time also, to obviate losing the few minutes spent in stopping with the unavoidable deceleration and acceleration, long non-stop runs were made. Though timings were no better after the races than they had been before them, these spurts had shown what it was possible to accomplish — and what, even now, has not yet been attained in regular service. That is why it is useful to consider these races at some length, with the causes that brought them about, the means used by each of the competitors to try and secure the victory and to show how it happened that afterwards, the *statu quo ante* should have simply been reverted to.

The bid for the mail contracts, has been one of the main causes of the race to the North. The same incentive caused the *G. W.* to exert considerable efforts for retaining them, in the course of which one of its locomotives reached the highest authenticated speed ever achieved by any railway train. We will therefore take these several races separately, but, before doing so, we will briefly quote a very few recent instances of very fast running of regular trains.

On October 1932, for instance, the « Leeds Breakfast Flier » ran 8 consecutive miles (13 km.) at an average speed of 93.7 miles (145.3 km.) per hour, with a maximum, at Little Bytham, of 93.7 miles (150.8 km.), thus beating the *G. W.*'s « Cheltenham Flier »'s 92.3 miles (148.6 km.) per hour.

On September 19th, 1933, one of the four *L. M. S.*'s Coventry motor-works specials covered the 93.5 miles (150.5 km.) from Coventry to a signal stop outside Euston in 74 m. 20 s., at an average speed of 75.5 miles (121.5 km.) per hour, with a maximum speed of 92 miles (148.1 km.) per hour whilst running through Castlethorpe. The train was a light one and consisted of but 7 coaches weighing 200 tons, hauled by a three-cylinder « Royal Scot » locomotive.

It is so often contended, on the other side of the Channel, that British expresses are featherweight trains, that we once again quote a remarkable instance of what *L. N. E.* Pacifics accomplish when hauling a heavy train. On September 14th, the 7.55 ex-Edinburgh express comprised, when leaving Doncaster, 19 vehicles, weighing 622 tare tons, or 655 in service. Two of the 17 minutes the train was late, were made up between York and Doncaster, where the load was the same as when leaving the Scottish capital. The next 79.6 miles (128.1 km.) to Peterborough including a 20-mile (32.2 km.) climb were covered in 85 minutes, i. e. at an average speed of 56.1 miles (90.3 km.) per hour, thus regaining 6 more minutes of the lost time, and another couple of minutes were made up beyond, which entailed running at over 60 miles an hour, for considerable distances and climbing gradients at high speed [1].

It is no longer a very rare occurrence for regularly booked trains to travel at over 90 miles (145 km.) an hour when running late and making up lost time, nor for specials to run at speeds very considerably in excess of the booked timings. This should be remembered when considering the future of railway travel and it should be borne in mind that fast trains can stil be considerably quickened up and that, *with perfect safety.*

X-5*bis*. — **The races to the North** [2].

(1) Details of this remarkable run will be found in the September 29th, 1933 number of the *Railway Gazette.*

(2) A great many of our data are culled from Mr. Scott's excellent little booklet entiled KINNABER.

— Competition between the East and West Coast Routes has occasionally become very acute and has twice spurted out and caused actual racing between London and the North.

The East Coast Route is made up of the following elements :

Great Northern Ry. — King's Cross to York. . . . . (comprises 28 miles = 45 km. over *N. E.* tracks).	188 miles (302.6 km.).
North Eastern Ry. — York to Edinburgh . . . . . (comprises 57.5 miles = 92.5 km. over *North British Ry.*).	205 miles (329.9 km.).
North British Ry. — Edinburgh to Aberdeen. . . . . (comprises 38 miles = 61 km. over *Caledonian Ry.*).	130.5 miles (210.0 km.).
Total. . .	523.5 miles (842.5 km.).

The West Coast Route is made up of the following :

London and N. Western Ry. — Euston to Carlisle	399.3 miles (642.9 km.).
Caledonian Ry. — Carlisle to Aberdeen Central	240.9 miles (387.6 km.).
Total. . .	539.8 miles (868.7 km.).

All East Coast trains stopped at the frontier of the various constituant Companies' lines (York and Edinburgh) to change crews and locomotives. As they had to stop at Newcastle as well, there were always one or two more stops on the East than on the West Coast Route. To this should be added, on the single track Arbroath North Box and Hillside section, five bad slacks for securing right of way which lost at least another 5 minutes. Generally speaking, gradients were heavier on the East Coast than on the West, and curves sharper, more especially on the *N. B.* section.

On the other hand, the West Coast has a bad start out of London (one mile of 1 in 70 = 14.4 mm. per m.), but afterwards there is a splendid 330-mile (531 km.) stretch with ruling maximum 1 in 330 (3 mm. per m.) gradients.

The 1888 Races. — These races took place between London and Edinburgh, over the East and the West Coast Routes. On August 1st, the best time from King's Cross was 8 hours (1); on the 13th, this was reduced to 7 h. 45 m. and the fastest run of all took 7 h. 26 1/2 m. But the Preston accident which occurred soon after, and which was due to excessive speed in rounding a faulty curve, put an end, for the time being, to any further speeding up.

The 1895 Races to Scotland, were run to Aberdeen and had an added point of interest due to the fact that the East and West Coast Routes joined at Kinnaber Jn., 38 miles (61.2 km.) this side of Aberdeen, both trains then running on over the *Caledonian's* line. In the most unlikely event of their arriving dead heat, the owning Company would of course show the other the sporting courtesy of letting it run on ahead. And in spite of the 500 miles (roughly) they had run from London, this actually did happen !

Since the previous 1888 races, the

(1) This includes a 5-minute stop at Grantham, 20 minutes spent in York and a further stop in Newcastle. In the course of the races, a total of 15 minutes stoppages were cut out.

trains had been timed in just under 14 hours to Aberdeen, including a 50-minute stop for lunch at Perth, which both trains reached in 11 hours. To obviate the expense and inconvenience entailed by further racing, the rival Companies came to a gentlemen's agreement, whereby neither of them was to cut the time of the London and Edinburgh journey beneath 8 1/2 hours. During 6 years, this was adhered to, in spite of the East Coast having, through the building of the Forth and Tay bridges, shortened its route to all places North of Edinburgh. Curiously enough, acceleration first came from the West Coast when, as early as 1889, it ran a new express in 10 h. 15 m. to Perth and in 12 h. 50 m. to Aberdeen, thus beating the East Coast by 30 minutes.

Though the opening of the Forth and Tay bridges route provided the *North British* with an independent line to Perth and Aberdeen, their train timings remained unaltered (1), and that, though it was made to understand that if their shorter route also became the faster one, the mails might be diverted to it.

Once again the West Coast improved its timing, and its 8 p.m. Aberdeen express was advertised on an improved schedule so as to connect with the *Great Northern of Scotland*'s further North trains (2). From July 1st on, it ran a new express due to reach Edinburgh at 7 a.m. This time, the East Coast accepted the challenge and speeded up its 10 p.m. Scotch express so as to reach all Scotch towns in advance of its rival's 10 p.m. train. It also cut 15 minutes off its own 8 p.m. express to Aberdeen (arriving there at 7.20 a.m.) No better could then be done as the *N. E.* was unable to improve on its timing, so the entire 15 minutes were made up South of Edinburgh. No racing took place for another fortnight (1), but this was the lull before the storm.

At the time, the East Coast's 8 p.m. Scotch Express took 11 h. 20 m. to Aberdeen, and the West Coast's, 11 h. 35 m. Both were heavy trains but the East Coast's usually reached Kinnaber from a quarter to half an hour before its rival.

THE 1st ROUND. — *July 15th to July 21st.* — On July 15th, the West Coast suddenly posted up an improved schedule whereby, from that very day, its 8 p.m. Scotch express was to reach Aberdeen by 7 a.m. next morning, covering the 540 miles (869 km.) in the round 11 hours. The 10 p.m. train was quickened at the same time.

The East Coast timing remained unchanged, so the West Coast freakishly enjoyed itself in cutting its own records. As in 1888, the first stop took place at Crewe and 175 minutes were awarded for the next run on to Carlisle, an improvement of 3 minutes only on the 1888 timing, though the latter included a 20-minute stop at Preston. This foreshadowed much tighter timings for the future, were it necessary to apply them. But the *Caledonian Ry.* did much better : the 32.5 miles from Forfar to Perth (52.3 km.) were covered in 35 minutes and on July 17th, Aberdeen was reached at 6.21 a.m., a record which would take some beating.

THE 2nd ROUND. — *July 22nd to July 28th.* — The East Coast then replied and

(1) Yet the East Coast Route was 9 miles (14.5 km.) shorter to Perth and 16.5 miles (26.5 km.) to Aberdeen.

(2) Arrival in Aberdeen at 7.20 a.m., but still 5 minutes after the East Coast's train.

(1) There then were 8 stoppages on the East Coast and 12 on the West.

cut its London-Aberdeen timing down to 10 h. 45 m., i. e. 15 minutes under the West Coast's (1). The latter immediately retaliated, the *L. N. W.* cutting out another 13 minutes and the *Caledonian* 12, so as to arrive at Aberdeen at 6.35 a. m.(2).

The East Coast's trains spent the entire scheduled time at each station and then rushed on to Arbroath where they arrived 5 minutes (and once 7 minutes) before schedule. In spite of this, they usually reached Kinnaber after the West Coast's train, which got there a couple of minutes ahead of its timing.

THE 3rd ROUND. — *From July 29th to August 18th.* — At this period, the West Coast trains were timed to run to Aberdeen in 10 h. 20 m. and the East Coast's, in 10 h. 25 m.

The latter then advertised further accelerations to come into force on the following Monday, with another 20 minutes cut (3) and the running of a relief to Perth and places beyond, so as to lighten the racer's load (4).

The West Coast immediately retaliated by quickening its own run by 9 minutes South of Carlisle and 6, between Carlisle and Perth. Both trains were light, the East Coast's weighing but 180 tons (on July 29th) after having dropped a coach at York. Thanks to double heading, the *N. E.* made up, North of Newcastle, the time that had been lost South of it, which enabled the East Coast's train to reach Aberdeen at 6.20 a. m., after having spent 21 minutes at the various stoppages, often simply waiting for official permission to go on !

The West Coast's train was a lighter one, and consisted of 7 coaches weighing 160 tons. It stopped as short a time as possible at the stations and was thus able to reach Aberdeen at 6.05 a. m. and next day, through the *Caledonian*'s splendid run of 240.5 miles (387 km.) in 283 minutes, at 5.59 a. m. (1).

For quite a time, this remained the fastest journey of the race, as even the demands of racing trains had to take the grouse season into account and heavier trains consisting of from 11 to 14 coaches, were unable to reach Aberdeen more than 10 minutes ahead of scheduled time. The East Coast's traffic being the heavier, its trains arrived later still.

No change took place on August 1st (2). But on the 15th, the West Coast was only able to beat its rival by one minute to Kinnaber and on the following Monday, both trains were signalled simultaneously, a truly wonderful performance after so long a run. Nothing could have excited popular feeling to a greater extent, especially as the *Caledonian* gallantly al-

(1) This was done by reverting, over the *Great Northern*'s section, to its 1888 racing time to York (3 h. 35 m.), which was a clear gain of 15 minutes; to this, the *North Eastern* easily added another 12 and the *North British*, a further 8. Arrival at Aberdeen took place at 6.45 a. m.

(2) Until the final sprint, the trains stopped at the following places :

East Coast. — 4 minutes at Grantham, 5 each at York and Newcastle, 4 minutes at Edinburgh and again at Dundee, 2 minutes at Arbroath besides the 5 bad slacks on the single track section. Total time spent in stations, 24 minutes.

West Coast. — 5 minutes at Crewe and as much in Carlisle; 3 minutes at Stirling, 5 at Perth, 2 at Forfar, altogether 5 stops taking 20 minutes.

Besides this, both trains stopped 2 minutes at the ticket platform, outside Aberdeen.

(3) The *G. N.* gained 7 minutes, its run being 2 minutes faster than its best 1888 timing.

(4) This train connected with an Inverness special and gained 10 minutes on the rival line's 8 p. m. express.

(1) The *L. N. W.* gained but 6 minutes.

(2) The King's Cross 8 p. m. relief to Perth, with 8.10 p. m. train were retained. As for Bradshaw it still quoted the « official » July 15th timings.

lowed the foreign Company's train to precede it into Aberdeen and for the first time, the East Coast's arrived at 6.17 a.m. and the West Coast's at 6.20.

THE 4th ROUND. — East Coast's official timing in 9 h. 40 m. (later in 9 h. 13 m.); West Coast's, in 9 h. 35 m.

This was a net gain of 45 minutes to the East Coast, the *G. N.* contributing 10 minutes, the *N. E.* no less than 26, and the *N. B.* having cut out the Arbroath stop, 9 minutes. The 60.5 miles (129.5 km.) from York to Newcastle were covered in 60 minutes, this being the first instance of a 60-mile an hour average start to stop speed (1). But in the near future better speeds still were to be attained.

So as to reach Aberdeen 5 minutes ahead of the East Coast, the West Coast was obliged to maintain, between London and Carlisle, an overall speed of 57.3 miles (92.2 km.) per hour including one stop. As a matter of fact, this was improved upon, the entire distance between Euston and Carlisle being run at 60 miles (96.6 km.) an hour and the frontier reached 11 minutes ahead of time. As on the East Coast, another stop was dispensed with, and the *Caledonian*'s train, having run non-stop through Forfar, arrived at the ticket platform at 5.05 a.m. and 10 minutes later at Aberdeen, 16 minutes ahead of the East Coast's.

In the meantime, not only station stops but further carriages were being dispensed with, and the trains were reduced to the equivalent of 6 1/2 coaches, weighing but 100 tons. This enabled the East Coast's to reach Edinburgh in 6 h. 44 ½ m., this being 10 minutes ahead of time and much faster than the present non-stop timing (1). But this was of little use for, inconceivable as it seems, the red tape Edinburgh station employees still held the train from 2.47 to 2.56 a.m., and the same occurred in Dundee, where 7 1/2 minutes were lost as well, simply so as to await the advertised starting time. Fast running on to Kinnaber was of little use as the train only got there at 4.47 ½ a.m. — 14 minutes too late whereas it could have arrived at 4.33 a.m.

The whole of the British newspaper reading public could have cried with vexation. A hastily summoned Conference did away with this red tapism on the very next day when the *G. N.*, having again cut its own record by 2 minutes and the *N. B.* brought down the time spent in Edinburgh from 4 to 2 minutes — quick work including a change of locomotive and luggage van — ran over the difficult stretch on to Dundee (59.5 miles = 100.8 km.) at an average speed of 60 miles (96.6 km.) an hour. But in spite of this, it was unable to beat the West Coast which led by less than one minute into Kinnaber, the smoke of the East Coast's train being visible when the West Coast's arrived. The latter's had been a magnificent run, the *Caledonian* having covered the last 89.8 miles (144.5 km.) in 81 minutes only, which was, so far, the fastest run of the whole race. This was accomplished, it is true, with a three-coach featherweight train (2) that reached

(1) The racer no longer carried the Perth coach and arrived at 4.44 a.m., but so that passengers for all advertised stations should be served, the 8.10 p.m., which was quickened by 5 minutes, connected with a new *N. B.* Arbroath and Aberdeen train. This train, which left Edinburgh at 3.34 a.m. was the only extra train the East Coast ran during the whole of the racing period.

(1) The *G. N.*, having gained 9 minutes as far as York, held the King's Cross and Grantham 79.5-minute record run over the 82.8 miles (133.3 km.) that separated the two places.

(2) When leaving London, the train was made up of 4 coaches weighing 90 tons.

Aberdeen at 4.58 a.m., whereas the East Coast's, delayed at Kinnaber Jn. arrived at 5.11 a.m. only.

Next day, the *L. N. W.* cut out the Stafford stop. Everything was sacrificed were it but to gain another minute and the Carlisle to Stirling run of 118 miles (189 km.) was accomplished in 114 minutes, being another instance of a run at over 60 miles an hour. These runs deserve more than a passing reference. The East Coast's 6-coach train weighing 105 tons had reached York in a fraction over the round 3 hours and the 124.5-mile (265.5 km.) Newcastle and Edinburgh run had taken but 114 minutes. The 60-mile an hour average speeds were already being improved upon over many a section of the racing lines, Edinburgh thus being reached at 2.19 a.m. Including 3 stoppages and 3 service slacks, the entire distance had been covered in 379 minutes, at the overall speed of 62.2 miles (100.1 km.) an hour. The *North British* repeated its previous performance and so reached Kinnaber at 4.30 a.m., beating the West Coast by 3 1/2 minutes and Aberdeen Central, at 4.40, as against its rival's 4.54 1/2. The entire run from London to Aberdeen had been accomplished at over 60 miles an hour, overall speed.

Exhibition run. — Having accomplished this with a flourish, the East Coast deemed it time to cease such expensive train playing and to return to everyday work. Not so the West Coast, who scheduled a train consisting of a van, a 10-berth sleeping car and one composite coach, to run from Euston to Aberdeen in 8 h. 32 m. 8 minutes were gained between London and Crewe. The long 58.5-mile (94.1 km.) bank from Preston to Shap Summit was then negotiated in 54 minutes and the descent onto Carlisle rushed down at such a speed that the entire 300 miles (482.8 km.) took but 276 minutes all told, which, owing to the lightness of the load, proved nothing. The Stirling stop was dispensed with, locomotives were changed at Perth and the ticket platform was reached at 4.30 a.m. in 6 minutes less time than the East Coast's record. It had taken but 512 minutes to run 540 miles (869 km.), at 63.3 miles (101.9 km.) an hour overall, and 65.5 miles (105.4 km.) an hour, running speed.

And next ?

Well next, the East Coast reverted to its advertised timing of July 29th, whereas the West Coast, until the end of the month, sported unscheluded racers, hoping in vain to put the East Coast on its mettle. Seeing the uselessness of its endeavours, its racer was consolidated as far as Crewe with its 8 p.m. and a fast special was then run on to Aberdeen, which it reached at 5 a.m.

Casting an eye over the entire racing period, it will be seen that the 8 p.m. down trains, which originally reached Aberdeen Central at 7.32 a.m. had been gradually quickened up until they arrived at 4.32 a.m. the time of the journey falling from 11 h. 20 m. to 8 h. 32 m. An 11 h. 30 m. timing was then reverted to and this remained unchanged until the year 1923.

X-*ster*. — **The Great Western racers.** — When carrying the Ocean mails from Plymouth to London, both the *L. S. W.* and the *G. W.* trains accomplished remarkable runs, securing or retaining of the mail contracts being a considerable incentive thereto. But the most famous of them all was run by a *G. W.* special on May 9th, 1903, in connection with the *German Lloyd's* S.S. « Kronprinz Wilhelm », which had berthed at Milbay, with 1 300 mailbags, at 8 a.m.

The mails were first transferred to a tender, then again to a 148-ton train (reduced to 120 in Bristol where the Northern mail van was uncoupled).

Milbay Docks are connected with North Rd. by 0.9 mile of hard climbing.

The train was headed by the 4-4-0 locomotive « City of Truro », now exhibited in the York Museum, which was to take it to Pyle Hill Jn., at Bristol, whence the 4-2-2 « Duke of Connaught » would haul it on to London.

Despite the exceptionally heavy mail, the train got away at 9.19 a.m. North Rd. was reached in 3 m. 7 s., and Exeter in 59 m. 2 s. This run included, of course, the 1 in 42 (23.8 mm. per m.) single track Teignmouth to Dawlish bank, and a speed of 60 miles an hour was thereafter maintained as far as Whiteball, where the historic exploit that established the « City of Truro »'s fame began. Accelerating rapidly up to 96 miles (154 km.) an hour down the Wellington Bank, this speed was kept up as far as Fitzwarren, and was then increased to 100 miles an hour for half a mile (800 m.) until a maximum speed of 102.3 miles (164.6 km.) an hour was reached — the highest at which any railway train has ever travelled.

FROM PADDINGTON TO	Distance		Time pent.
	Miles	Km.	
Bristol East Depot.	117.0	188.3	101'52"
Taunton	162.8	262.0	142'39"
Whiteball	173.7	279.6	154'27"
Exeter	193.6	311.9	172'34"
Newton Abbot . .	213.8	344.3	195'1"
Totnes	222.5	358.0	206'46"
Brent	229.0	368.5	216'12"
Hamerdon. . . .	...	...	226'24"
North Road . . .	245.6	394.2	233'35"

These 1904 timings are all better than those of to-day's « Cornish Riviera Express » and « Cheltenham Flier » but, it should be borne in mind, they were the exceptional runs of a regular train; also — and this is in their favour — the latter travelled along the longer Bristol instead of the Castle Cary Route, and arrived in Plymouth 37 minutes ahead of time (1).

X-6. — **Long non-stop runs.** — Each of the three principal Railway Companies, the *G. W.*, the *L. M. S.* and the *L. N. E.* is responsible for one of the three fastest runs in the country.

Table 73 gives the fastest of these besides the *Southern Ry's* best, though it follows at some distance behind the others.

The length of the longest runs has been constantly increasing. For close upon a quarter of a century, the *G. W.*'s Paddington-Plymouth run headed the list, but competition between the East and West Coast Routes incited each of them to tackle ever longer non-stop runs and after having caught up the *G. W.*'s they have long since considerably extended it.

The West Coast's former longest run from Euston to Crewe (158.1 miles = 242.8 km.), has since been extended to Carlisle. The East Coast's King's Cross and York (188.2 miles = 302.6 km.), was superseded by King's Cross and Newcastle (268.7 miles = 432.4 km.), and more recently, as was bound to happen, by through non-stop Anglo-Scottish runs far and away the longest in the World.

(1) Owing to the careful running necessary in getting out of Paddington Station, it was at Ealing only that the train got into its stride. It then maintained an average speed of 71.8 miles (115.6 km.) per hour over the 101.2 miles (162.8 km.) between Ealing and Bath and of 70 miles (112.6 km.) an hour over the 157 miles (252.6 km.) between Ealing and Taunton.

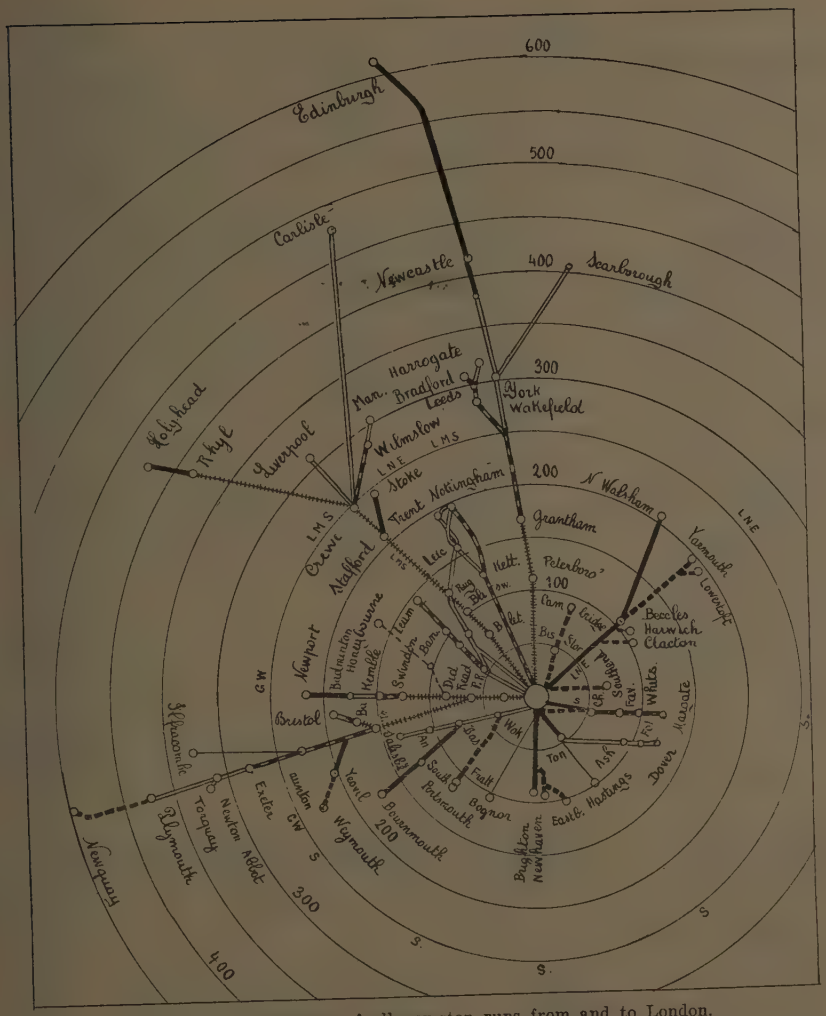

Fig. 29. — Cartogram of all non-stop runs from and to London.
(See legend, fig. 7, p. 1028/46 of the November 1933 *Bulletin*.)

Names of owning Companies shown as follows : G. W. = Great Western Ry. — S. = Southern Ry. — L. M. S. = London Midland & Scottish Ry. — L. N. E. = London & North Eastern Ry.

TABLE 73.

LONGEST BRITISH START-TO-STOP RUNS.

Obsolete non-stop runs are shown in italics.

COMPANY AND RUN.	Distance		Time of departure.	Time spent.	Speed		
	Miles.	Km.			Miles/h.	Km./h.	
L. M. and S. Ry.							
Euston-Glasgow	401.5	646 1	R 10.00 a. m.	7.40	52.4	84 3	Royal Scot.
Do. -Edinburgh	400.0	643.7	R 10.00 a. m.	7.40	52.2	84 0	Do.
Do. -Carlisle	299 0	481.2	R 12.11 noon	5.34	53.7	84.5	Do.
(Euston)-Crewe-Stirling	258.8	416.5	10.43 p. m.	6.57	43.5	70.0	
Do. do. -Holyhead	263.6	424.5	R 12.27 noon	5.12	50.7	81.6	Irish Mail.
Do. do. -Perth	291.8	469.6	10.32 p. m.	6.18	46.3	74.5	Royal Highlander.
Do. do. -Glasgow	243 3	391.5	R 10 30 p. m.	5.20	45.6	73.2	Night Scot.
Do. do. -Edinburgh	242.0	389.4	R 10 00 a. m.	5 30	44.0	70.8	Royal Scot.
Do. do. -Mortherwell	230.8	371.4	10.50 p.m.Sa.	5.00	46.2	74.3	Night Scot.
Do. do. -Golwyn Bay	219.8	353.7	R 12.06 noon Sa.	4.54	45.0	72.4	
Do. do. -Rhyl	*209.3*	*336.9*					
Do. do. -Prestatyn	205 5	330.8	11.15 a. m.	3.40	56.0	90.1	Welshman.
Euston-Liverpool	193.8	311.9	6.05 a. m.	3 35	54.0	86.9	Merseyside.
Do. -Manchester L. Rd.	188.5	302.6	6 00 p. m.	3.15	58.0	93.3	
Do. -Wilmslow	176.9	284.8	R 10 08 a. m.	2 52	58.0	99.3	Lancastrian.
Do. -Crewe	158.1	242.8	R 10 35 a. m.	2.40	59.2	95.2	
Do. -Stoke-on-Trent	146 0	235.0	R 1.15 p. m.	2.30	58.4	93.9	
L. and N. E. Ry.							
King's Cross-Edinburgh	392.7	631 9	10.00 a. m.	7.30	52.4	84.0	Flying Scot.
Do. -Newcastle	*268.7*	*432.4*					
Do. -Darlington	*232.2*	*373.6*					
Do. -Scarborough	*230.0*	*370.0*	*11.53* a. m.	*4.00*	*57.5*	*92.5*	*Scarborough Flier.*
Do. -York	188.2	302.9	11.50 a. m.	3.15	57.9	93.3	Do.
Do. -Harrogate							*Harrogate S. P.*
Do. -Leeds	185.7	299.0	R 4 02 p. m.	3.12	58.1	93.4	Queen of Scots.
Do. -Wakefield W.	178 8	282.9	4.45 p. m.	3.07	57 2	92.0	West Riding Pull.
Great Western Ry.							
Paddington-Exeter	173.7	279.6					
Do. -Newquay	281.0	450.8	10.40 a. m.	6.05	46.2	74.3	
Do. -Plymouth	225.7	363.4	10.30 a. m.	3.57	57.6	92.7	Cornish Riviera.
Do. -Ilfracombe	203.8	328.0	R 10.30 a. m.	5.05	40.9	65.8	
Do. -Torquay	199 7	322.4	12.00 noon	3.35	56.2	90.4	
Do. -Newton Abbot	193.9	312.0	11.00 a. m.	3.20	58.2	93.6	
Southern Railway.							
Waterloo-Salisbury	83.6	134 6	3.00 p. m.	1 27	57.7	92.8	

The *L. M. S.*'s Scotch expresses stop at Carlisle for locomotive purposes and at Symington, where they are split into two sections which diverge at Carstairs so as to run both to Glasgow and to Edinburgh. But on April 27th, 1928, the two sections ran separately (as they frequently do) and the Symington stop being useless on

this occasion, the train headed by the « Royal Scot » locomotive, ran non-stop for the first time, all the way from Euston to Glasgow, a total distance of 401.4 miles (646.1 km), but this feat was exceptional. The East Coast's « Flying Scotsman », on the other hand, runs non-stop each Summer, since May 1st, 1930, between Euston and Edinburgh (Waverley), special corridor tenders being provided to enable a change of crews to take place midway.

But apart from these enormous runs, others are quite noteworthy. « The Night Scot » for instance, stops only once between Glasgow and Willesden Jn., and its run from Crewe to Willesden Jn. is the fastest in the country, with the exception of the « Cheltenham Flier »'s.

Another point of note is that the general speeding up has entailed the cutting out of many intermediate stops and many important expresses leave the main lines after already long runs and continue without stopping until they reach their ultimate destination, sometimes quite a distance away. This is the case :

On the *G. W. Ry.*, for the Paddington-Torquay or Newquay trains;

On the *L. N. E.*, for the King's Cross-Leeds, Harrogate and Scarborough trains;

On the *L. M. S.*, for the Euston-Holyhead, Liverpool and Manchester trains.

Another feature of British railways is that, along the main lines, there are a considerable number of places whereat certain trains stop for the first time after leaving London instead of such runs being reserved to just a few of the very important towns that lie on the way. We have drawn attention to the fact both in the tables which quote all such runs and in figure 8, p. 1030/48 wherein we have underlined the names of all places that can be reached by non-stopping trains from London. All these places have been plotted out.

Whenever there is sufficient justification, non-stop trains are run to seaside and other resorts. This presents no unusual feature for South Coast resorts such as Margate, Folkestone, Eastbourne, Hastings, Brighton, Bognor Regis or Bournemouth, as they are situated at no great distance from London, nor even for Yarmouth, Lowestoft, Harwich or Clacton-on-Sea, but places as far distant as Torquay, Newquay or Ilfracombe, on the *G. W.*, Southport on the *L. M. S.*, or Scarborough (1) on the *L. N. E.*, are quite a different proposition.

(1) All Scarborough trains now stop at York.

TABLE 74.

A FEW NEWSPAPER AND PERISHABLE GOODS EXPRESSES.

COMPANY.	NON-STOP RUN.	Distance		Time of journey.	Speed	
		Miles.	Km.		Miles/h	Km./h.
L. M. S.	Camden-Edge Hill (Liverpool)	191.2	307.7	4.54	39.0	62.8
	Crewe-Broad Street (London)	162.5	261 5	3.36	45.1	72.6
	Greenford-Cotton Hill (Shrewsbury) . . .	145.3	233.8	3.45	38.8	62.5
	Crewe-Carlisle	141.0	226.9	2.44	51.6	83.1
G. W.	Newbury (Racecourse)-Newton Abbot .	141.3	225.8	3.28	40.8	64.5
L. N. E.	Netherfield-Finsbury Park	125.2	201.5	3.05	40.6	65.4

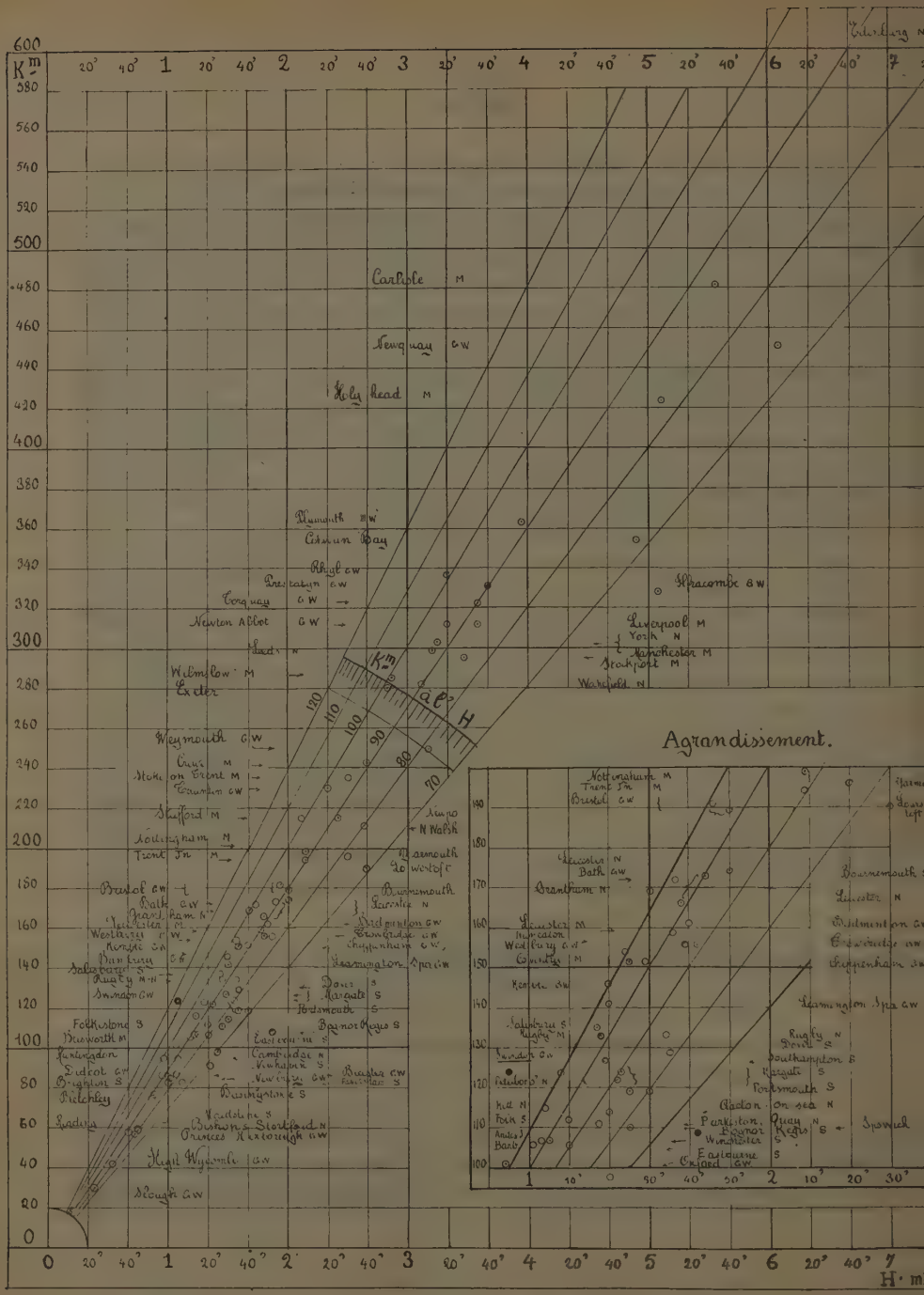

Fig. 30. — Graphical representation of all places served by means of non-stop runs from London. (See legend, fig. 7, p. 1028/46.

Note : **Agrandissement = Enlarged scale. — Km à l'H. = Km per hour.**

One could add indefinitely to the tables of interesting non-stop runs, especially if long stop runs of newspaper and fast goods trains be included. The former are but little, if at all, slower than the passenger train runs we have quoted and the latter are often accomplished at high speeds. Table 74 shows a few exemples of such runs.

A number of the longest non-stop runs disappear in the British Winter time tables, there no longer being sufficient through passengers to justifiy their maintenance. During the Winter months, the « Flying Scotsman » stops on the way and the Euston-Carlisle all the year non-stop run becomes the longest in the country.

Such long runs entail heavy calls on railway employees, as we have shown when dealing with the dining car services. Locomotive rosters show the same tendency, and locomotives often cover 200 miles (320 km.) and over, the longest trip, of course, being the « Flying Scotsman »'s, even during the Winter months, when it stops on the way. All the year round, the locomotive that starts it takes it all the way from London to Edinburgh or the reverse.

Here are a few examples of other daily locomotive runs :

		Miles.	Km.
L. N. E.	King's Cross-Newcastle	268.5	448.2
	Marylebone-Manchester C.	212.3	341.7
	Ipswich-Manchester C.	219.0	352.0
L. M. S.	Holyhead-Euston	263.5	424.0
	St. Pancras-Derby (1)	128.5	206.8
	Crewe-Perth	291.8	469.6
	Do. -Glasgow.	243.5	391.8
	Aberdeen-Carlisle	240.5	387.0

The *Railway Gazette* for October 20th, 1933, gives some interesting data concerning the actual daily work of the 75 *L.N.E.* Pacific locomotives, some of which perform their lengthy runs on several consecutive days or even during an entire week, in spite of the tightly-timed turnrounds :

—	From	To	Miles.	Km.
Newcastle, York, Leeds, Edinburgh, Leeds.	9.35 a. m.	1.29 a. m.	457	735
Grantham, King's Cross, York, Peterboro', Grantham	3.03 a. m.	5.09 p. m.	435	700
Newcastle, Edinburgh, York, Newcastle	3.13 p. m.	5.10 a. m.	409	658
Grantham, York, Doncaster, King's Cross. Grantham	1.15 a. m.	5.41 p. m.	376	605

Even tank locomotives now run long distances. The 2-6-4-T *L. M. S.* tanks, for instance, run the entire 101.8 miles (163.8 km.), from Whitehaven to Carnforth and take water once only on the way, at Barrow-in-Furness (2).

(1) Similar runs exist from St. Pancras to Leeds and to Derby.

(2) There are 11 intermediate stops as far as Barrow and 9 beyond, the train being usually made up of 7 coaches as far as Barrow, and two more beyond. It covers the last 21 miles (34 km.) between Lancaster and Preston, in spite of a 1 in 100 bank, at a speed of 48.5 miles (78 km.) an hour.

X-7. — **Conclusion.** — ROUTE MILEAGES. SPEEDS. — We have drawn up table 75 so as to show strikingly the route-mileage of each Company, whereon the fastest trains run at the various average speeds we have always considered : the field under 44 miles an hour, then speeds from 44 to 49.9 miles, from 50 to 55.9, from 56 to 58.9, from 59 to 62, and the field above 62 miles an hour.

We have also given the percentages of each of these mileages in regard to each system's total route-mileage.

TABLE 75.

ROUTE MILEAGE OF EACH BRITISH COMPANY'S FASTEST TRAINS AT VARIOUS AVERAGE SPEEDS.

Total mileage	Miles per hour. Over 62	59 to 62	56 to 58.9	50 to 55.9	44 to 49.9	COMPANY.	Kilometres per hour. Over 100	95 to 99.9	90 to 94.9	80 to 89.9	70 to 79.9	Total kilome-
3 801	77	233(1)	146(2)	213	465(4)	Great Western Ry.	124	372	135	343	748	6 1
6 947	209	44	178	692	619	London, Midland and Scottish Ry.	336	71	287	1 113	996	11 1
6 384	105	109	292(3)	497	798	London and North Eastern Ry.	169	175	478	800	1 284	10 2
2 194	...	...	172	351	212	Southern Ry.	...	...	277	565	341	3 5
144	...	...	...	75	15	Cheshire Lines.	...	...	...	121	24	2
183	...	...	...	...	53	Midland and Great Northern Jnt.	...	...	...	...	85	2
107	...	...	...	...	...	Somerset and Dorset Ry.	...	...	...	...	...	1
19 760	391	386	826	1 903	2 281	Totals.	629	622	1 330	3 063	3 671	31 8
100	1.98	1.95	4.18	9.72	11.54	Percentage of total.	1.98	1.95	4.18	9.72	11.54	1

(1) Including 6 miles, *Great C. and Great W. Jnt. Ry.*
(2) Do. 33 miles, *Great C. and Great W. Jnt. Ry.*
(3) Do. *Met. and Gt. C. Jnt. Ry.*
(4) Do. 51 miles (82 km.) Shrewsbury lines of the *G. W.* and *L. & W. Jnt.*

We have previously pointed out why we have only dealt with the greatest train speed on the various railway lines, however many trains actually run at this speed or a lesser one, instead of quoting each separate train as a distinct item, which is more usually done. When given irrespective of the relation of the lines to the entire system, we consider this misleading, as a system with a large number of very fast trains running along a single line, and slow trains over all the others would be on a par with the same total number of very fast trains, divided up amoung several distinct lines, which would certainly be much more meritorious.

But information concerning ALL very

TABLE 76.

AGGREGATE MILEAGE OF BRITISH RUNS AT 55 MILES PER HOUR AND OVER.

August 1933.

Co.'s total mileage.	64 m. p. h. and over	62 m. p. h. and over	60 m. p. h. and over	58 m. p. h. and over	55 m. p. h. and over		103 km./h. and over	99.8 km./h. and over	96.6 km./h. and over	93.3 km./h. and over	88.5 km./h. and over	Co.'s total kilometrage.
6 947	152 (1)	286 (2)	793 (7)	2 207 (30)	8 693 (119)	L. M. S.	219	460	1 276	3 552	13 990	11 180
6 401	...	106 (1)	275 (5)	623 (16)	4 785 (78)	L. N. E.	...	171	443	105	7 501	10 301
3 801	77 (1)	184 (2)	1 307 (13)	2 347 (23)	5 723 (76)	G. W.	124	296	2 103	3 777	9 210	6 117
2 175	...	...	...	...	881 (11)	S.	...	...	...	...	1 448	3 500
19 324	230 (2)	576 (5)	2 375 (25)	5 177 (69)	20 082 (284)		370	1 127	3 822	8 331	32 318	31 098

fast trains along any given line or lines is useful for other purposes, particularly concerning the Traffic Department and indeed, is an indispensable complement to the data we ourselves have provided.

We therefore reproduce from *The Railway Gazette* (1) and *The Railway Magazine* (2) a most interesting table summarising this information, to which we have simply added total mileages and kilometric equivalents. In all cases, the figures between brackets indicate the number of runs making up the aggregate.

AVERAGE TRAIN SPEEDS. — Since 1916, when our first train speed serial appeared in *The Railway Gazette*, we have advocated that the average overall train speeds of ALL intertown expresses were of equal, if not of more, importance to the travelling public than the speed of the best train connecting such places. We are glad to see that both *The Railway Gazette* and *The Railway Magazine*, who frequently supply interesting information concerning these matters, — and in which we have found many an item which has been of use to us, which indebtedness we gratefully acknowledge — have published (3) comprehensive tables concerning all express runs between London and a score of provincial towns, which has enabled us to draw up Table 77.

The frequency of the services is particularly noteworthy even without taking into account those instances where two Companies serve the same towns as is the case for Birmingham, Perth and Exeter.

(1) October 27th, 1933. — (2) November and December, 1933.

(3) *Railway Gazette*, October 27th, 1933; *Railway Magazine*, November, 1933.

TABLE 77.

AVERAGE OVERALL TIME AND SPEEDS OF LONDON TO PROVINCIAL TOWNS EXPRESSES.

RAILWAY.	BETWEEN LONDON AND	Distance		Number of trains.	Average overall time.	Average overall speed	
		Miles.	Km.			Miles/h.	Km./h.
G. W.	Birmingham	110.6	178.1	14	2.04	53.4	85.9
G. W.	Bristol	118.3	190.4	12	2.16	52.2	88.5
	Cardiff	145.3	233.8	13	2.56	49.5	79.7
	Exeter	173.5	279.2	10	3.10	54.8	88.2
	Plymouth	225.5	363.0	10	4.34		79.5
L. M. S.	Birmingham	112.9	181.7	15	2.03	54.9	88.4
	Nottingham	123.5	198.4	18	2.26	50.6	81.5
	Sheffield	158.5	255.1	17	3.17	48.1	77.4
	Manchester	188.6	303.9	12	3.38	51.8	83.4
	Liverpool	193.7	311.8	12	3.42	52.2	84.0
	Glasgow	401.4	645.5	6	8.12	49.0	78.9
	Perth	449.9	724.0	7	9.59	45.1	72.6
L. N. E.	Sheffield	164.7	265.1	14	3.20	49.4	79.5
	Leeds	185.7	298.9	16	3.43	50.0	80.5
	Newcastle	268.3	431.8	14	5.22	50.0	80.5
	Edinburgh	392.7	632.0	10	8.00	49.1	79.1
	Perth	440.4	708.7	10	9.52	44.6	71.8
	Aberdeen	523.2	842.0	6	11.42	44.7	71.9
S.	Bournemouth	107.9	173.6	12	2.13	48.7	78.3
	Exeter	171.7	276.3	10	3.34	48.1	77.4

Yet two points should be criticised. Before grouping, competitive Companies ran their fast trains practically simultaneously so as to offer the public the same facilities as their neighbours. And since the grouping, when this reason no longer holds good, practically no alteration has been brought about, lengthy expressless periods separated by others where there is a choice between a batch of two and sometimes three equally fast trains having been retained. There is certainly room for improvement here.

The second point is that the last fast day trains from London to the provinces, leave London too early and considerably earlier than do French trains, for instance, running to places at similar or greater distances

IRELAND.

CHAPTER XII.

The Irish railway system is a radiating one, with Dublin as a centre, the main lines running to the coast; other local lines complete it, of course.

The *Great Southern Ry.* owns most of the Free State's lines but, owing to lack of traffic, has decelerated many of its trains.

In Northern Ireland, the railways are in the hands of several distinct Compa-

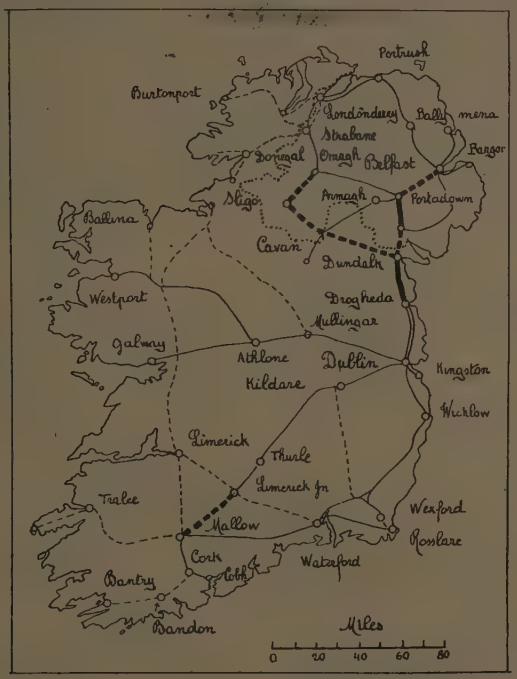

Fig. 31. — Cartogram of Irish train speeds.
(See legend, fig. 7.)

nies. The *Great Northern*'s fast trains still have a number of short quick runs, though fewer and slower than last year (1932).

The *Northern Counties Committee* is the Irish section of the *L. M and S. Ry.*

The *Londonderry and Lough Swilly Ry's* lines are laid to the 3-foot gauge, as

are those of the *County Donegal Joint Committee*, which is owned by the *Midland* and *Great Northern* (Ireland) *Rys.*

We have grouped in table 78 all noteworthy runs showing how these railways are operated.

TABLE 78.

NOTABLE RUNS IN IRELAND.

COMPANY AND RUN.	Distance Miles.	Distance Km.	Time of departure.	Time spent.	Speed Miles/h.	Speed Km./h.	
Great Southern Ry.							
Dublin-Thurles-Cork G. Rd.	165.5	263.4	7.00 a. m.	3.55	41.8	67.3	
Limerick Jn.-Mallow	37.3	59.9	9.37 a. m.	0.47	47.4	76 4	
Mallow-Cork G. Rd.	21.0	33.8	10 26 a. m.	0.29	43.5	69.9	
(Cork) Mallow-Fermoy	16.8	26.9	7.12 p. m.	0.25	40.2	64.0	
Dublin W. Rd.-Waterford	117.3	189.6	6.35 a. m.	4.19	27.3	43.9	Mail train.
Dublin Br.-Galway	126 5	203.6	7.20 a. m.	3.40	34.5	55.5	
Dublin Br. Mullingar	50.3	80 9	7.20 a. m.	1.16	39.7	63.9	
(Dublin) Athlone-Achill	109.3	175.9	9.30 a. m.	5.15	20.8	32.5	Ltd. Mail.
Great Northern Ry.							
Dublin-Dundalk-Belfast	112.5	179.0	9.00 a. m.	2.30	44.5	71.6	4 stops.
Dublin Am. St.-Drogheda	31.8	51.2	9.00 a. m.	0.33	57.8	93.1	
Portadown-Belfast	25.0	40.2	10.59 a. m.	0.31	49.6	79.8	
Dublin-Dundalk	54.3	87.7	*2.15* p. m.	*0.27*	*55.3*	*89.0*	Summer 1932.
	Do.	*Do.*	*3.15* p. m.	*0 54*	*60.3*	*97.1*	*Do.*
Dublin-Dundalk-Londonderry	121.5	195 5	R 4.10 p. m.	3.55	31.0	49.9	
Dundalk-Omagh	87.8	141.3	R 5 03 p. m.	1.52	47.0	75.7	
(Dublin) Portadown-Omagh (L.)	41.0	66.0	9.10 a. m.	1.03	39.1	62.9	Express. 1 stop.
Northern Counties Committee.							
Belfast-Antrim-Londonderry	95.3	153.3	9.30 a. m.	2.45	34.5	55.7	9 stops.
Belfast-Newcastle	42.3	68.2	2.30 p. m.	1.00	42.3	68.2	Express.
Belfast-Bangor	12.8	20.5	several	0.20	38.2	61 5	
County Donegal Jt. Committee.							
Londonderry-Killybeg			10.00 a. m.	3.53			
Londonderry and Lough Swilly.							
Londonderry-Burtonport	74.5	121.5	10.00 a. m.	5.35	13.6	21.8	

In table 79, we have shown not only the fastest and longest non-stop runs, but also other interesting data such as boat trains and slip carriages.

As Irish Railways follow the same practices as do British Railways, there is no need to go into them at any length, all the more so as the only line that re-

TABLE 79.

FASTEST AND LONGEST NON-STOP RUNS.
ALSO BOAT TRAINS AND SLIP CARRIAGES.

COMPANY AND RUN.	Distance		Time of departure.	Time spent.	Speed	
	Miles.	Km.			Miles/h.	Km./h.
Fastest non-stop runs.						
G. N. Ry.: Dublin Am. St.-Drogheda.	31.8	51.2	9.00 a. m.	0.33	57.8	93.1
Drogheda-Dundalk . . .	22.8	36.7	9.35 a. m.	0.25	54.7	88.1
Goraghwood-Portadown .	15.8	25.4	10.39 a. m.	0.19	49.8	80.2
G. S. Ry.: Limerik Jn.-Mallow (Cork)	37.3	59.9	9.37 a. m.	0.47	47.4	76.4
N. C. C.: (Belfast) Greenisland-Ballymena	26.8	43.0	1.30 p. m.	0.37	43.5	69.9
Longest non-stop runs.						
G. N. Ry.: Dundalk-Omagh	87 8	141.3	R 8.39 p. m.	1.52	47.0	75 7
G. S. Ry.: Dublin-Maryborough . . .	51.0	82.1	7.00 a. m.	1.13	41.9	67.5
N. C. C.: Greenisland-Portstewart .	58.3	93.7	R 5.03 p. m.	1.25	41.0	66.1
Boat trains.						
G. S. Ry.: Kingston-Dublin-Cork . .			6.10 a. m.	4.45		
Id. -Streamstown-Galway			6.14 a. m.	4.46		
G. N. Ry.: Id. -Dublin-Belfast . . .			Do.	2.56		
G. S. Ry.: Rosslare Hr.-Mallow-Cork.	134.5	216.4	R 6.30 p. m.	4.10	32.3	51.9
G. N. Ry.: Larne Hr.-Belfast . . .	24.3	39.0	several	0.35	41.6	66.9
Slip carriages.						
G. S. Ry.: Dublin-Kildare (Cork) . .	30.3	48.7	9.30 a. m.	0.45	40.1	64.5
G. N. Ry.: Dublin-Drogheda	31.8	51.3	*3.15* p. m.	*0.33*	*58.1*	*93.5*

tains fast trains is the *Great Northern Ry.* on its international Dublin-Belfast runs, in spite of there being both ways lengthy 1 in 100 (10 mm./m.) banks. The best train, hauled by 3-cylinder, 4-4-0 locomotives, now takes 2 h. 20 m., with 3 intermediate stops, one of which, for custom purposes, takes 10 minutes. A carriage is slipped at Drogheda on the northward trip, but a stop is made there on the return journey.

Cheap excursion trains have become a popular feature and are largely patronised owing to the exceptionally low rates charged for them.

Here are a few typical instances :

Whole-day Dublin and Portrush *N.C.C.* excursions cover 135.5 miles (218.1 km.) at a cost 2 sh. 6 d. for whole-day, and 1 sh. 6 d. for half-day excursions, which works out at but a penny for 7 1/2 miles (12 km.).

The same Company's Belfast and Whitehead 29.5-mile (47.5 km.) excursions cost 6 pence for the return journey. When they were first started, five special excursion trains were run, and their number increased until they accommodated 4 000 excursionists.

The *B. and C. D.* 24.5-mile (39.4 km.) Dublin and Bangor excursions cost 6 pence for the return trip and drew 5 000 passengers, whilst the *Great Northern* ran similar excursions from Dublin to Skerries.

Owing to the relative poorness of the country, it is rather surprising to note how successful **Pullman cars**, all third-class, have been, since they were introduced on the *Great Southern Ry.*'s Dublin and Limerick, Cork and Sligo lines in July 1926. A number of tea car services, have been added since then.

Conclusion. — Table 80 which shows each Company's fastest trains route mileages at various average speeds, speaks for itself.

TABLE 80.

ROUTE MILEAGE OF EACH COMPANY'S FASTEST TRAINS AT VARIOUS AVERAGE SPEEDS.

Total mileage.	Average speed		COMPANY.	Average speed		Total kilometrage.
	over 50 m.p.h.	44 to 49.9 m.p.h.		over 80 km./h.	70 to 79.9 km./h.	
2 187	...	37	Great Southern Ry.	...	60	3 391
617	70	131	Great Northern (Ireland).	113	211	993
280	...	...	Northern Counties Committee.	...	...	451
3 084	70	168	Total.	113	271	4 835
100	2.19	5.26	Percentage of each system.	2.19	5.26	100

(To be continued.)

[656 .253 (.42)]

Battery-operated colour-light signals on the London and North Eastern Railway.

(The Railway Gazette.)

The general layout of the area concerned with this interesting signalling installation, and in which the principal feature is the Goole swing bridge, is shown in the diagram reproduced as figure 1. In the old installation Goole Bridge North and South boxes were each situated 400 yards from the swing bridge and protected the approaches thereto. The box on the bridge was not a block post, being engaged solely in the work of opening and closing the bridge, but it has now been converted into a signalling box, enabling the North and South boxes to be dispensed with. The work previously performed by Goole Station box has been transferred to Boothferry Road signal-box, and it also, has therefore been closed, the whole scheme thus resulting in an economy of three signal-boxes.

The area now resignalled covers 14 track miles, and there are ten colour-light signals in all, beginning, on the up line, at U3 and ending at U6 and, on the down line, at D6 and ending at D2. These signals are of the Westinghouse Brake & Saxby Signal Company's searchlight type, fitted with 4-volt, 3-watt lamps.

As the bulk of the work is located between Goole and Saltmarshe, the extension of the transmission mains which begin at Goole, beyond Saltmarshe, would have been expensive. To avoid this, Staddlethorpe up intermediate block home signal is a mechanically-worked colour-light signal, having an ordinary upper quadrant spectacle casting, fitted with red and green spectacles illuminated day and night by a Cooke-type fog-penetrating electric lamp. This signal is similar to those already in operation at Hunwick, Wiske Moor and Cowton in the North Eastern Area, but is distinguished by having an auxiliary light giving a red aspect in the event of the main lamp failing. This auxiliary light — which will be described in a later paragraph — as well as the main light, is approach-lighted by the occupation of T. C. 1 and current is derived from primary batteries.

Signal D2, Saltmarshe down intermediate block home, is similar in all respects to the other searchlight colour-light signals, but has only two aspects, red and green, and is approach-lighted by the occuption of T. C. 39. The reason for there being only two aspects in this signal is that it is leading up to ordinary mechanical semaphore signals and marks the end of the colour-light area on the down line. In the case of the up line, it was not found necessary to provide two-aspect repeater signals under the last semaphore signal leading up to the colour-light signals, as there is ample braking distance from the existing up distant to the up starting signal U3.

The signals are continuously lighted and each is provided with a red auxiliary light. The auxiliary lamps are illuminated only if the main lights fail, and, in that event, show a red light for all aspects. They are of the fog-penetrating type, operating at 8 volts, 5 watts, but are fitted with a special hood formed of thin concentric metal shields which prevent any but horizontal rays entering

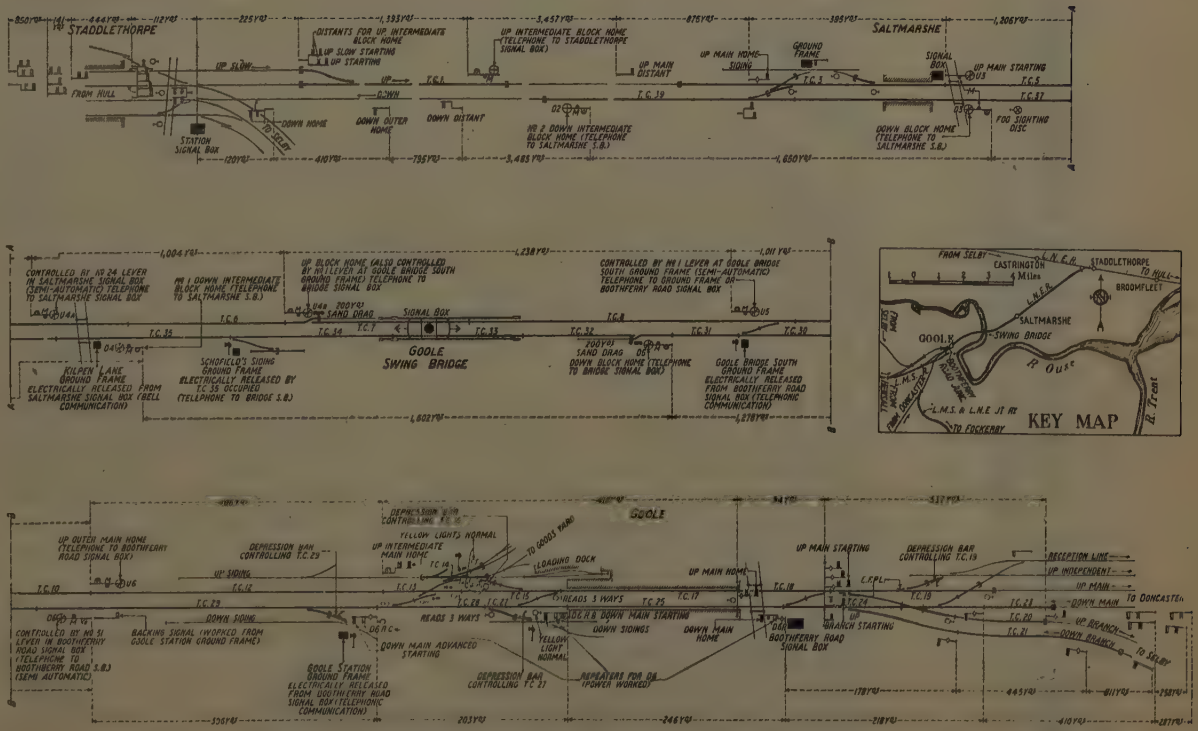

Fig. 1. — Signalling diagram of the battery-operated colour-light signal installation.

or leaving the lamp. Thus, although the advantages of a fog-penetrating lamp of high candle-power and low-current consumption are obtained, there is practically no risk of halation or phantom indications being given. Each signal is controlled from either a signal-box or ground frame and is provided with a telephone. Signals U4A, U5 and D6 are semi-automatic, the controlling levers

Fig. 2.
Westinghouse searlight signal fitted with Cooke auxiliary light.

Fig. 3.
Pole line transformer.

being normally left in the reverse position, the remainder are always controlled.

Signalling at Goole station.

Boothferry Road signal-fox now controls the whole of the station working at Goole. An illuminated diagram is provided and indicators for all signals not visible from the box—including disc signals—are placed, together with emergency plunge releases, on a specially-constructed instrument shelf, just above the levers concerned. Three sets of points, Nos. 6, 8 and 10, at the north

end of the station, are power-worked, being beyond the regulation distance for mechanical operation. The ground frames at the station and at Goole Bridge South are both electrically released from Boothferry Road, and colour-light signals U6 and D6 are controlled by levers Nos. 24 and 31 respectively. The mechanically-worked down home, down starting and down advanced starting signals each have power-operated semaphore distant arms fitted below, acting as repeaters for colour-light signal D6, to allow adequate braking distance. These repeaters are automatic and are controlled only by their respective track circuits, the top arms and D6. Thus, if D6 is showing yellow or green, the track circuits ahead are clear and the three mechanically-worked semaphores are pulled « off », the power-worked repeaters will come off automatically.

Fig. 4. — Goole Bridge signal-box control panel.

The swing bridge panel and relay interlocking.

The arrangements at the swing bridge box are worthy of special note. Instead of providing the orthodox type of power frame, a small panel and relay interlocking, figure 4, has been provided. An interesting feature of the swing bridge panel is that the panel itself is capable of a lateral movement through a wide angle, so that the signalman can place it in whatever position is most convenient for him. The panel is really a combined illuminated diagram and control panel, clearly shown in figure 4. It is fitted with small thumb switches, by means of which the respective points and signals can be operated, the whole of the interlocking being accomplished electrically.

The protection and operation of the bridge.

A 200-yard facing sand drag has been provided in the approach to each side of the swing bridge, and, before the bridge can be swung, the points—which are operated by low-voltage point machines—must lie for the sand drag. The sand-drag points are approach-locked by their respective track circuits, T.C.6 on the up line and 31 and 30 on the down, but an automatic time release is provided which has a time lag of 2 minutes after the track circuits are occupied. An emergency clockwork time release is also provided; this is set manually. It will release the bridge balance lever should the need arise.

Three mechanical levers are provided in the swing bridge box, Nos. 1 and 3, each operating a bridge circuit coupler

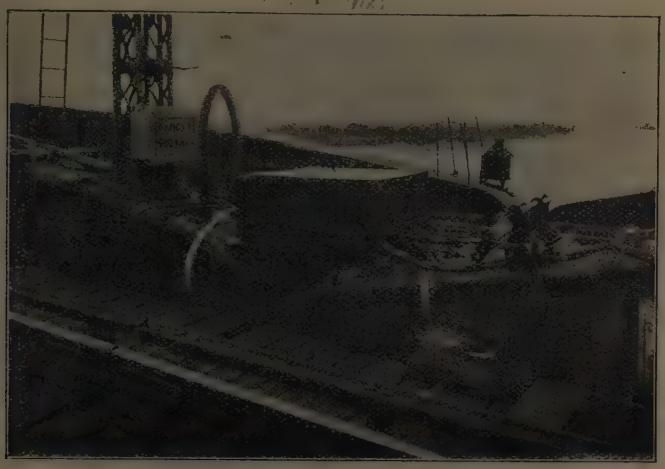

Fig. 5. — Circuit couplers carrying signal control circuits and 600-volt lines across the swing span.

and two bridge detection bolts, and No. 2 lever being the release lever electrically locked by the control panel and releasing Nos. 1 and 3 mechanically, which in turn release the hydraulic levers. The operation is as follows : providing the appropriate track circuits are clear, the sand-drag points are placed normal, *i.e.*, for the sand drags, and signal U4B and D5 placed at « danger. » The release lever is now free, and when pulled breaks the 600-volt power line through a quick-break circuit breaker and releases the bridge circuit coupler levers, which are now pulled. All circuits passing over the bridge are now broken, with the exception of the telephone and block bell lines. The hydraulic levers may now be operated and the bridge swung for river traffic.

The bridge circuit couplers, figure 5, were specially designed by the Westinghouse Brake & Saxby Signal Company for this scheme and carry all signal control circuits, including the 800-volt lines, across the swing span of the bridge into

the swing bridge box and on to Saltmarshe. One coupler is fixed at each end of the swing span and they are operated mechanically by the levers described above. The bridge detector bolts at each end operate on the same rod as the respective couplers and prove that the bridge is correctly aligned before the

Fig. 6. — Aerial cable suspension between telegraph masts and Goole Bridge box.

couplers can engage. When the bolts are « in » they operate circuit-closers which then allow a bridge detection relay to pick up. The controls of all the appropriate protecting signals are taken through « up » contacts on this relay, thus automatically proving that the bridge is properly in position before the signals can be cleared.

Telephonic and block bell communication.

Telephonic and block bell communication is maintained, when the bridge is swung, by means of an aerial cable suspended between the telegraph masts on either side of the river, and led off to a swivel insulator on top of the swing bridge box, figure 6. The span is 916

feet from mast to mast, this constituting one of the largest spans in this country to be bridged by a suspender wire carrying a seven-core cable.

It will be seen that apart from telephonic and block bell communication, no other indications are provided in the swing bridge box when the bridge is swung for river traffic, and it was not considered that these indications were essential, as, should the bridge be opened for river traffic, the signalman would be powerless to take any action with regard to railway traffic, and that whatever emergencies might arise these would be taken care of by the sand drags. Had such indications been considered necessary, an additional aerial mast would have been required, and this, in addition to being an expensive item, would have been a very intricate and difficult proposition. It should be mentioned that the height of the present communication circuits crossing the bridge on the aerial masts is upwards of 100 feet above high-water mark.

Saltmarshe signal-box has been provided with an illuminated diagram and controls colour-light signals D2, D3, D4, U3 and U4A, as well as working the existing up home and distant signals mechanically. Kilpen Lane level crossing ground frame is electrically released from Saltmarshe. All the illuminated diagrams conform to the North Eastern Area standard practice, having spotlight track circuit indications, provided by two 4-volt lamps in parallel and giving no light with track clear and red lights with track occupied.

Transmission lines.

Power for all controls is obtained from the Yorkshire Electric Power Corporation at Goole station at 230 volts, 50 frequency. This is stepped up to 600 volts and passed to line through an automatic circuit breaker operated by a no-volt trip coil. This forms a broken-line protection system which will immediately cut off the supply in the event of either of the power wires being cut or broken.

In order to prevent the operation of the automatic circuit breaker when the swing bridge is opened, suitable reactances are imposed across the transmission lines on the Goole side of the bridge, thus compensating for the length of line and the load cut-off when the bridge is opened.

The 600-volt transmission lines are run on the pole line carrying the communication circuits, at a distance of 4 feet below the ordinary communication circuits, aerial braided cables being employed for the purpose. All the cables used on the work were supplied by the Macintosh Cable Co. Ltd. For control purposes, the pressure is reduced to 110 volts by means of pole line transformers, figure 3, at suitable points, and, from these points, feeders are run to the various locations where the current is rectified and the pressure again reduced to trickle-charge sets of accumulators.

Transformers.

Seven-pole line, oil-immersed transformers are provided, these having a 600/110 ratio and being wired in parallel with the mains through special knife switches which permit of any one transformer being taken out of service without affecting the remainder. From the secondary of the transformers, 110-volt lines feed the adjacent locations, where combined rectifier and transformer units trickle-charge accumulators, at voltages varying from 30 volts, for the power point machines — the accumulators for these being of the nickel-iron type — to 2 volts for the track feeds. The charging rate of the rectifiers can be varied by means of an adjustable air gap on the incorporated transformers.

It will be appreciated that the above arrangements adequately ensure against interruption to the power supply and

consequent traffic delays, and render a stand-by set unnecessary. All accumulators on the bridge and on the Saltmarshe side are of sufficient capacity to allow the bridge to be swung and the circuit couplers opened for 10 % of the time, in addition to all accumulators having a capacity which permits of a total disconnection of the power supply for 24 hours without a voltage drop of 10 % being exceeded in any feeder or cable.

Track circuits.

The track circuits are of the D.C. type, the North Eastern Area standard 10-ohm relay being employed. The track circuits are fed by accumulators, trickle-charged, as previously described, thus eliminating the cost of maintaining primary batteries.

The combined type of lever lock and circuit breaker has been used at all interlockings; each unit, *i. e.*, the lock or circuit breaker of this type is interchangeable and can be used separately, an unusual feature being that they are painted in accordance with the lever colour — thus making it easier to distinguish one from another.

This interesting scheme, which was designed in collaboration with and to meet the wishes of Mr. C. M. Jenkin Jones, Superintendent, and Mr. C. M. Stedman, Locomotive Running Superintendent, of the North Eastern Area, has been carried out to the design and specification of Mr. A. E. Tattersall, M. Inst. E. E., Signal and Telegraph Engineer, North Eastern Area, and under his personal supervision; the contingent permanent way alterations and ancillary construction works were carried out by Mr. J. Mc Ilvenna, A. M. Inst. C. E., District Engineer, Hull, both sections of the work being under the general direction of Mr. John Miller, B. E., LL. D., M. Inst. C. E., Engineer for the North Eastern Area.

The whole of the signalling work — with the exception of telegraph and telephone apparatus — which was installed by the L. N. E. R. staff — was carried out by the Westinghouse Brake & Saxby Signal Co.

NEW BOOKS AND PUBLICATIONS.

[385. (09 (.460)]

COMPANIA DE LOS FERROCARRILES DE MADRID A ZARAGOZA Y A ALICANTE. **Reseña historica de su constitucion y desarrollo. Actuación de la Compañia durante los últimos veinte años (1913-1931). [Madrid-Saragossa and Alicante Railways Company. Historical review of its foundation and development. The Company's activities during the last twenty years (1913-1931.)]** — One vol. (9 1/2 × 6 3/4 inches), of 271 pages, with numerous inset diagrams. Madrid, Sucesorès de Rivadeneyra, S. A., Paseo de San Vicente, 20.

The Madrid-Saragossa and Alicante Railway is passing through a serious crisis in which respect it is not exceptional, as many railways are finding themselves in difficulties through the general economic crisis, through road competition, and even through competition by airways.

The object of this book is to point out and analyse the causes of this situation, undoubtedly temporary, to show the efforts made both on the technical as on the organisation side to improve the services and obtain more economical operation.

The book gives first of all a brief history of the formation of the Company, with particulars of the long series of alterations, purchases, and amalgamations of lines and railway systems, which finally resulted in the present Madrid-Saragossa and Alicante system, with a route mileage of 3 670 km. (2 280 miles).

In the first and second chapters, the authors analyse the different classes of traffic during the period considered and the corresponding receipts : passenger traffic, express goods traffic, and ordinary goods traffic. They bring out the influence of road competition which appears to be one of their main preoccupations; they give details of the respective position of the two means of transport and point out the steps taken to fight the competition and to end a situation which they consider to be abnormal and full of danger. Comparisons are given between different countries on the charges railway traffic has to carry, on the falling off of traffic, and on the level of the rates.

The chapter on operating costs distinguishes between those resulting from governmental regulations and those on which the Company has direct action and which by all sorts of measures it has succeeded in reducing.

As regards the present deficit, the money taken by the Government from the working receipts of the Madrid-Saragossa and Alicante Railway must be taken into account if a sound idea is to be formed as to the value of road and rail transport.

The last chapter gives particulars of the many steps taken or under consideration to make good the deficit : they affect both the organisation of the railway itself, the quality of the service offered to the public, and the general transport policy. In the last field, the efforts made with the idea of co-ordinating road traffic should be remembered, as they ended in the Minister of Public Works convening the National Conference on Transport which submitted to the Government a draft law the text of which is given as an appendix, with the reasons upon which it was based. We have already called the attention of the readers of the *Bulletin* (October 1932) to a report of the Madrid-Saragossa and Alicante Company, which sets out the whole question of road competition in Spain and gives particulars of the results expected from this new legislation.

The work is illustrated by many statistical diagrams showing the evolution of the traffic during the years 1913 to 1931.

E. M.